INTERAVIA

REVIEW OF WORLD AVIATION

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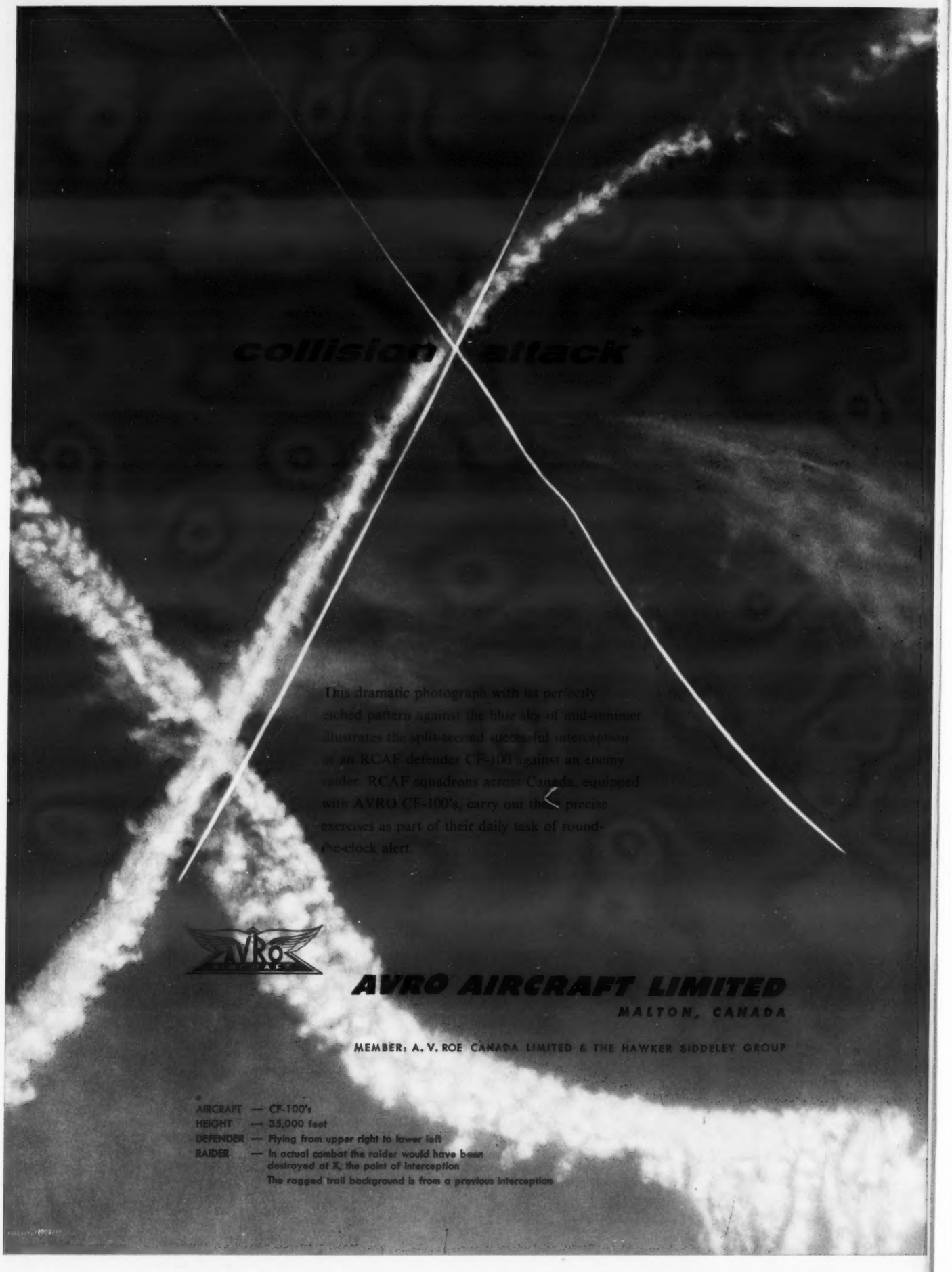
Edinburgh — Farnborough — Oklahoma — Scheveningen

VOLUME XI 11 NOVEMBER 1956



This dramatic photograph with its perfectly etched pattern against the blue sky of mid-summer illustrates the split-second successful interception of an RCAF defender CF-100 against an enemy raider. RCAF squadrons across Canada, equipped with AVRO CF-100's, carry out these precise exercises as part of their daily task of round-the-clock alert.

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AIRCRAFT — CF-100's
HEIGHT — 35,000 feet
DEFENDER — Flying from upper right to lower left
RAIDER — In actual combat the raider would have been destroyed at X, the point of interception
The ragged trail background is from a previous interception

INTERAVIA

Review of World Aviation

Volume XI No. 11 November 1956

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Front Cover :

The Lockheed L-1649A **Super Constellation** *will probably be the last new major piston-engined airliner to go into regular service. Afterwards turboprops and turbo-jets will take over. The L-1649A prototype made its first flight on October 10th, 1956 (see page 878 of this issue).*

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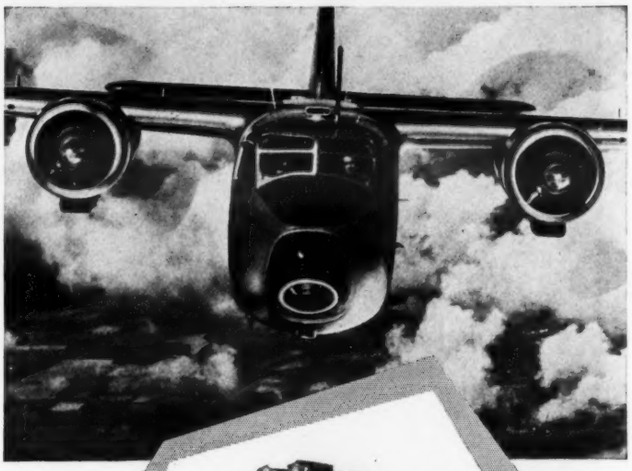

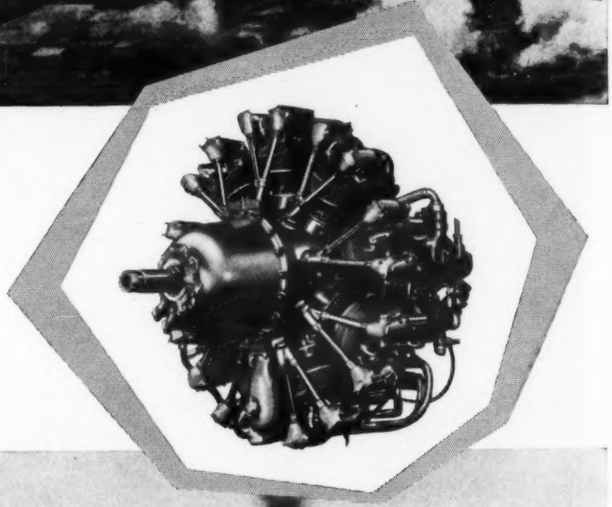

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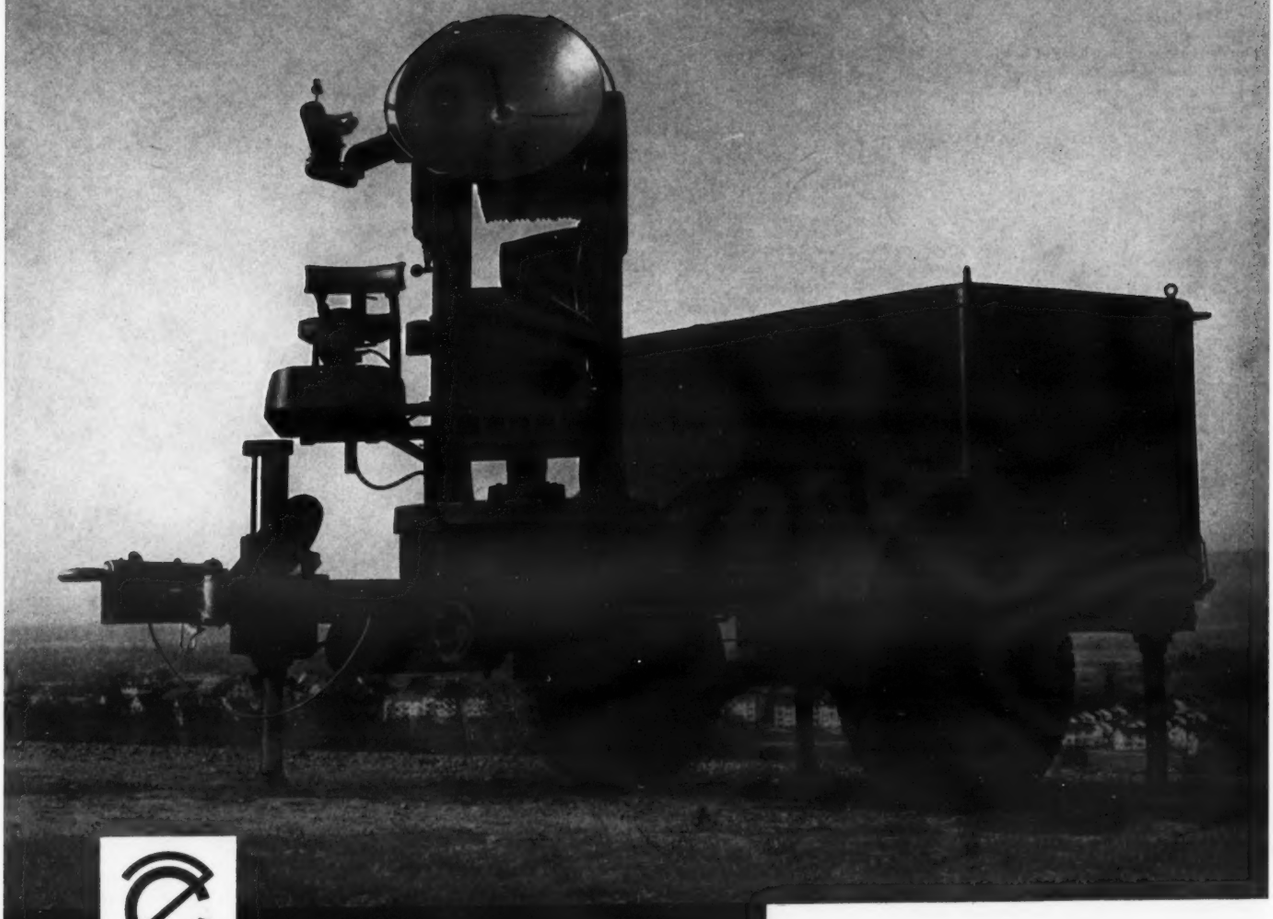

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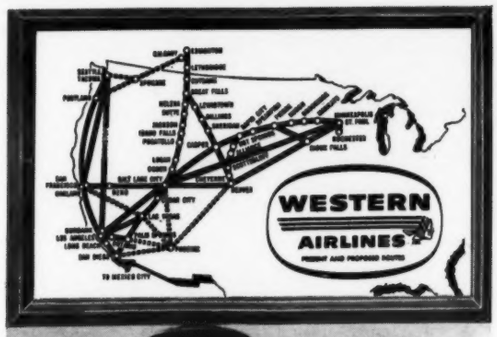

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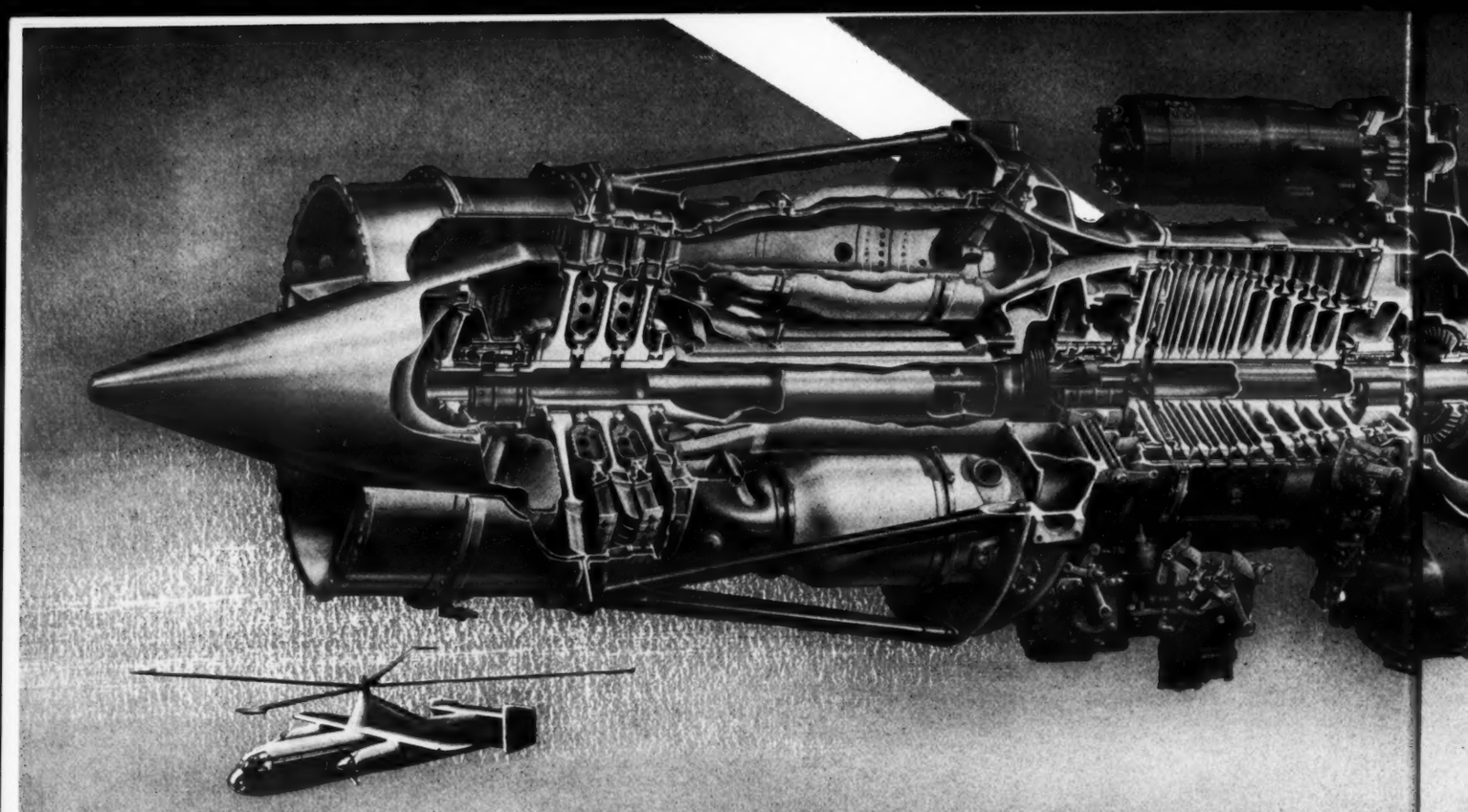

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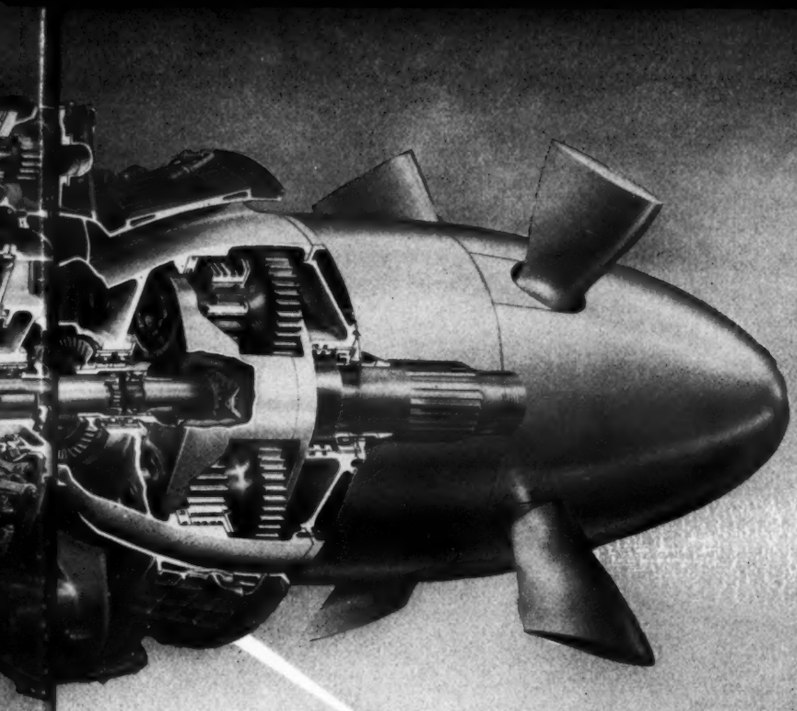
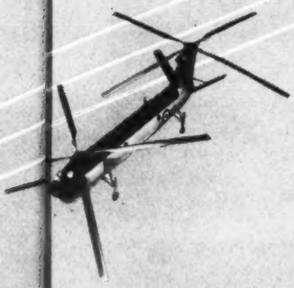
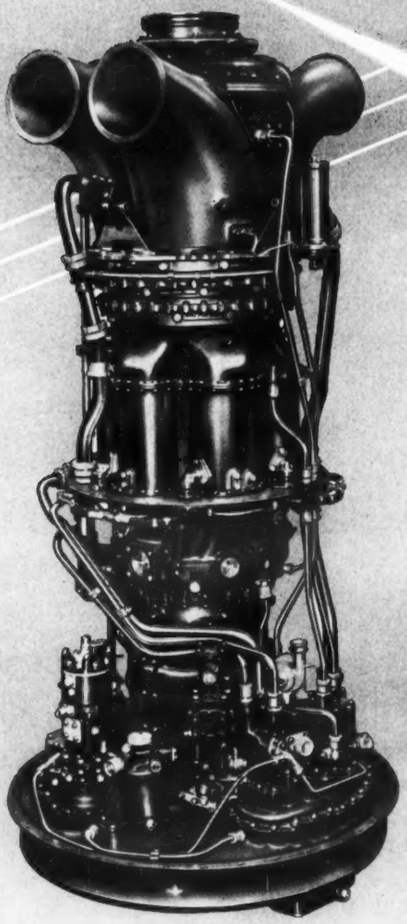


Eland turbo-prop





Gazelle free turbine engine

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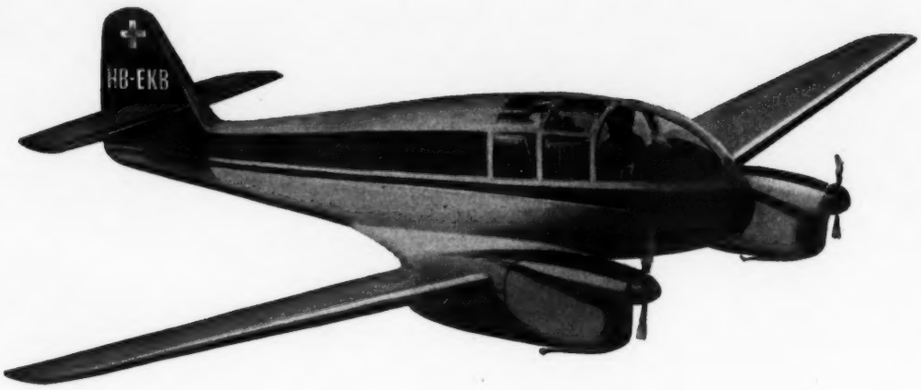

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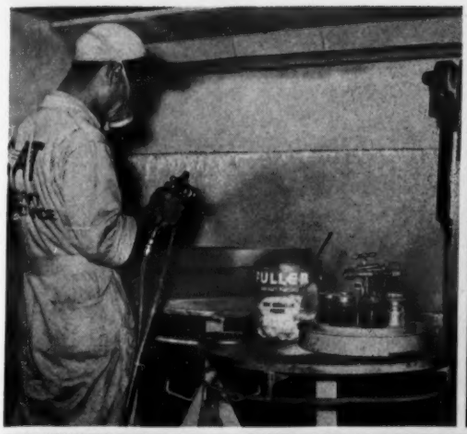

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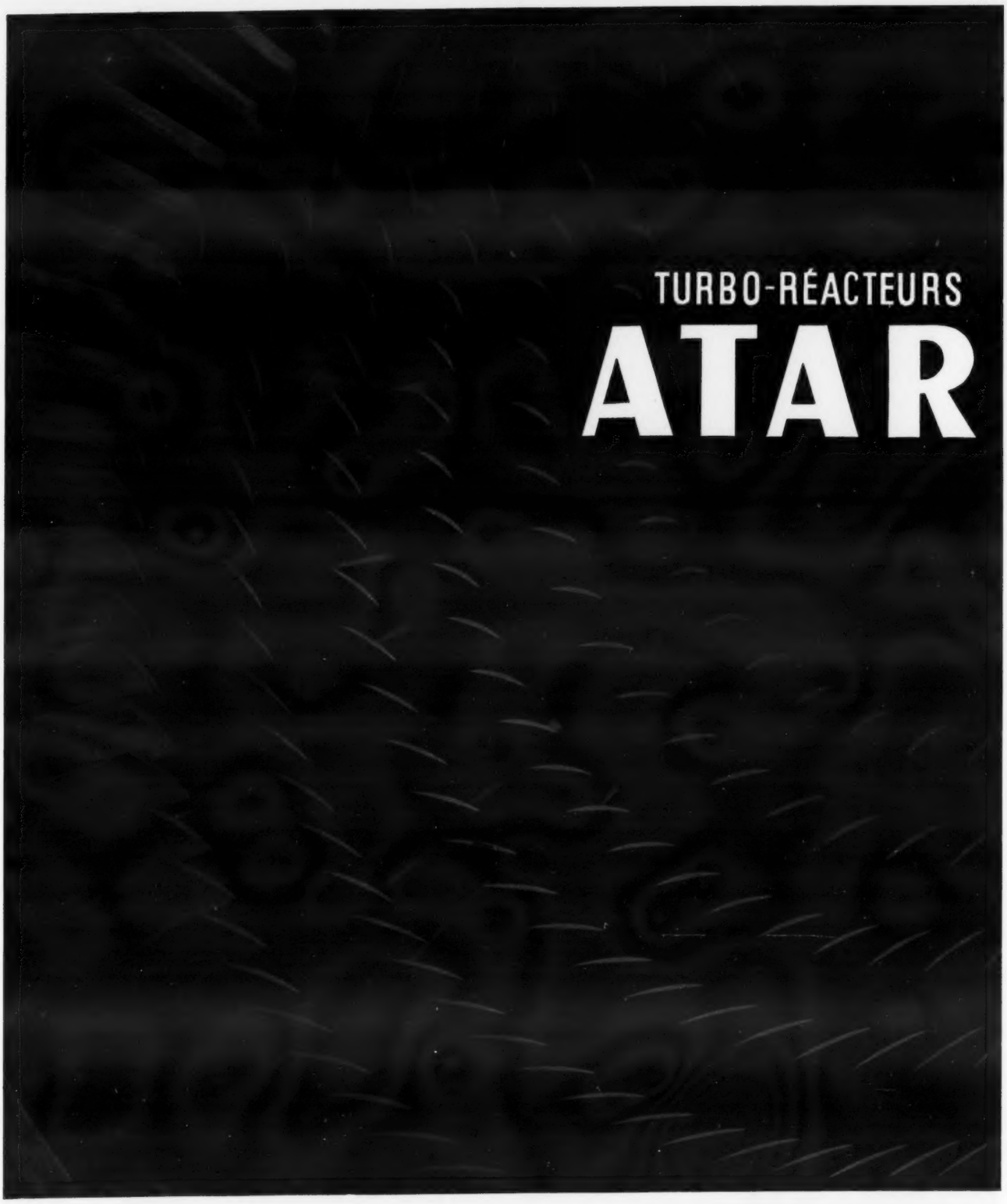

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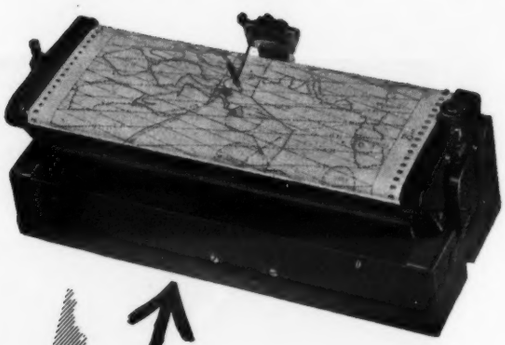

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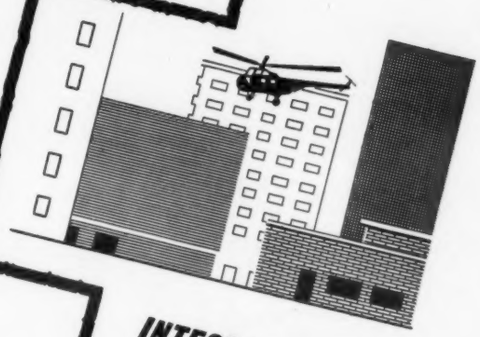

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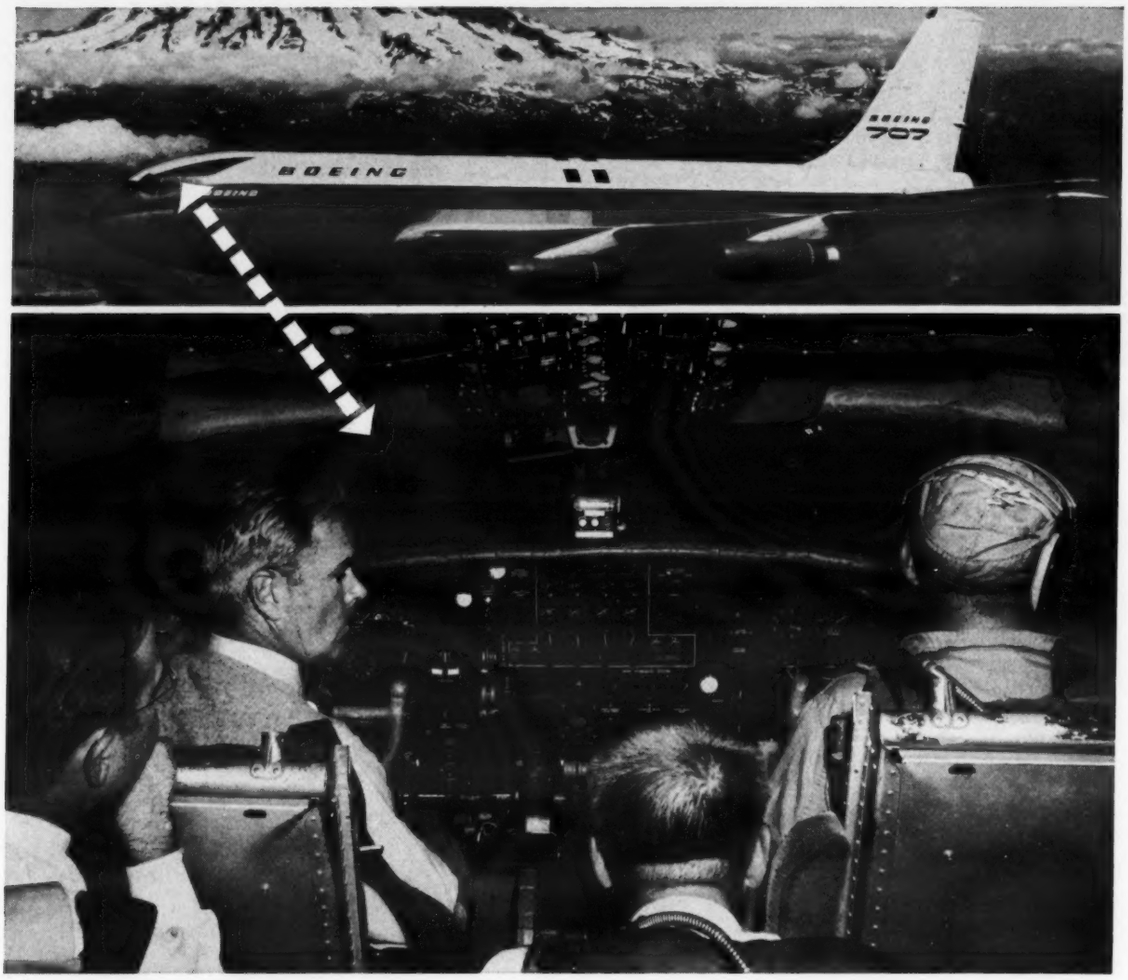

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You will, too, when you ride a great Boeing Jet Stratoliner!

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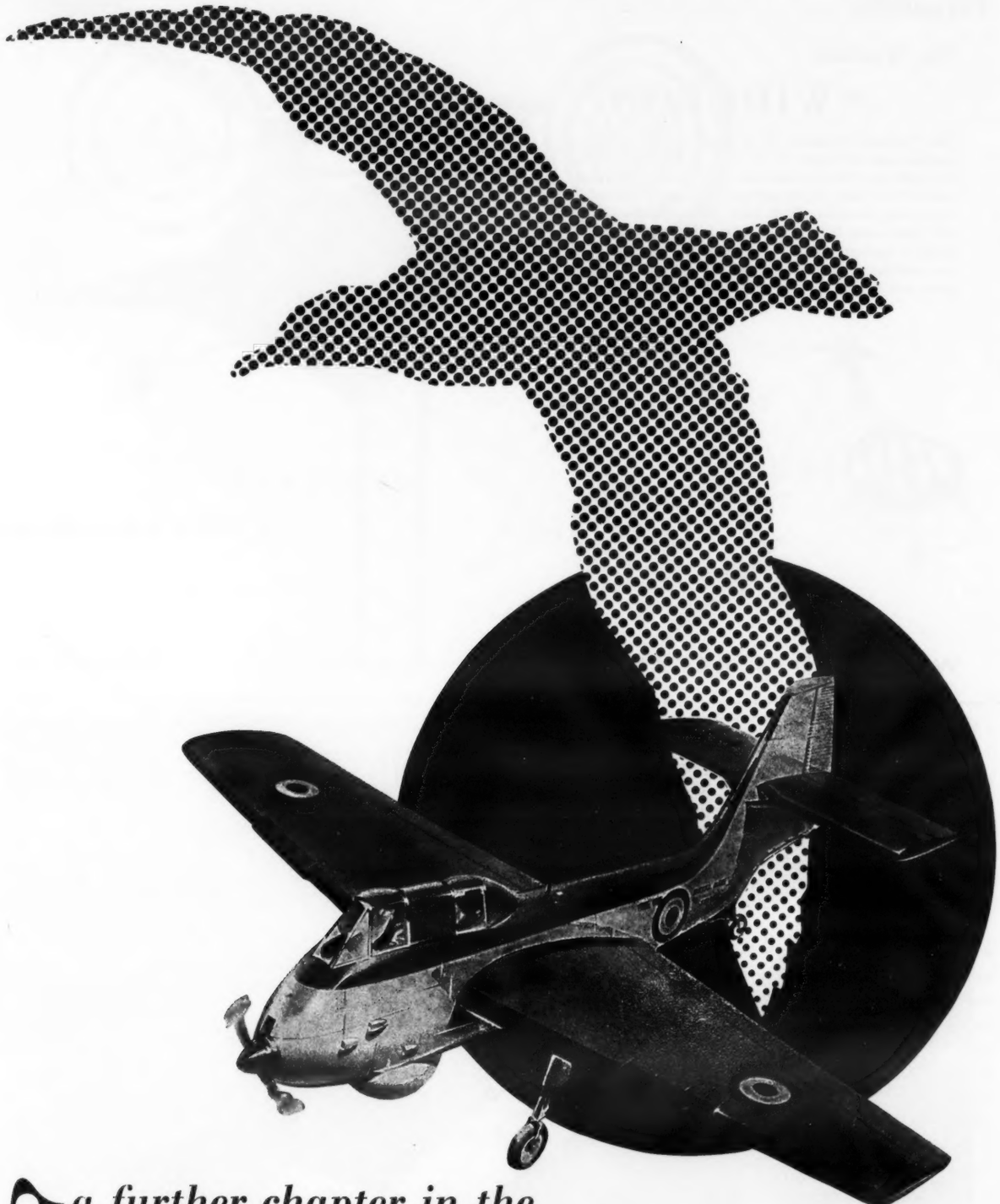

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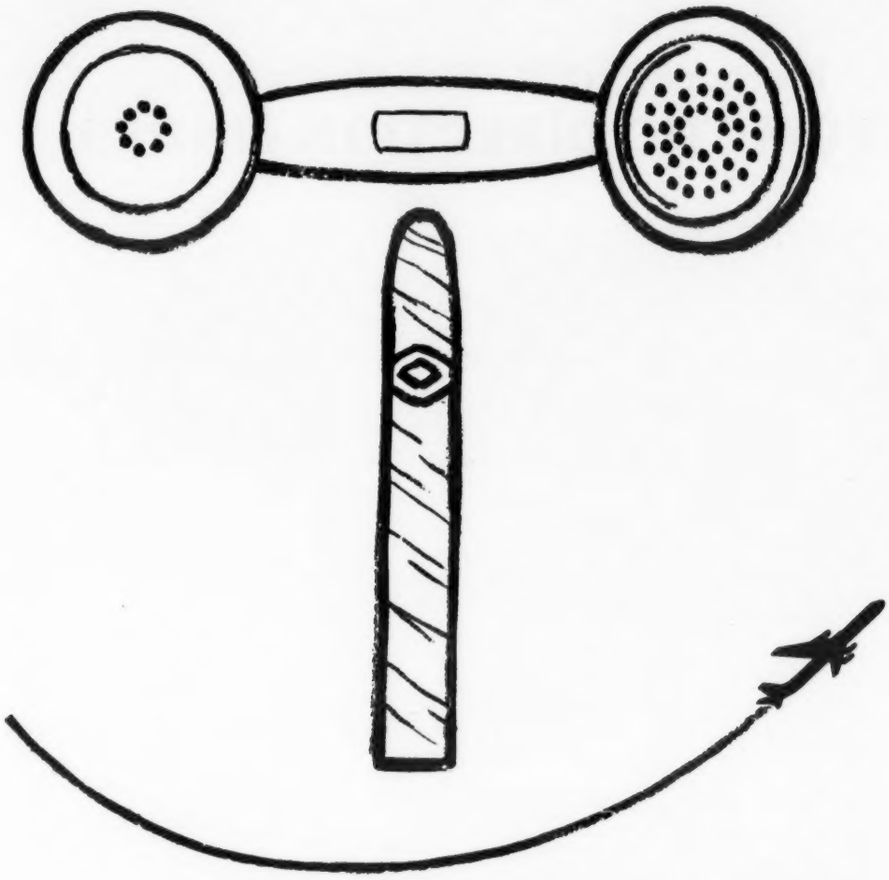

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Through our Field Service organization, we maintain a continuing and *permanent* interest in seeing that Douglas customers achieve maximum utilization of all Douglas aircraft. Our permanent service representatives for commercial aircraft are located in 20 major transportation centers throughout the world.

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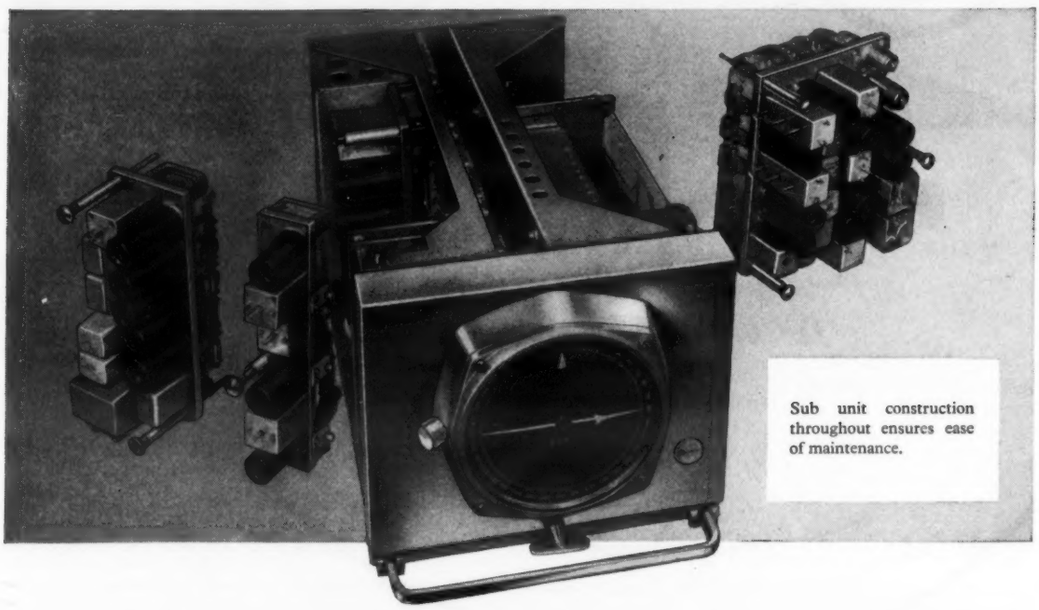
AUTOMATIC DIRECTION FINDER



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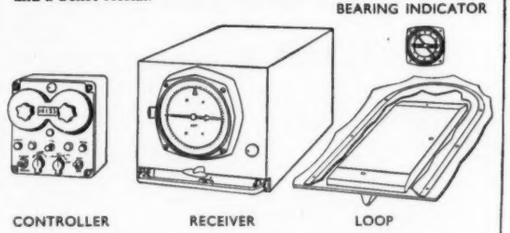

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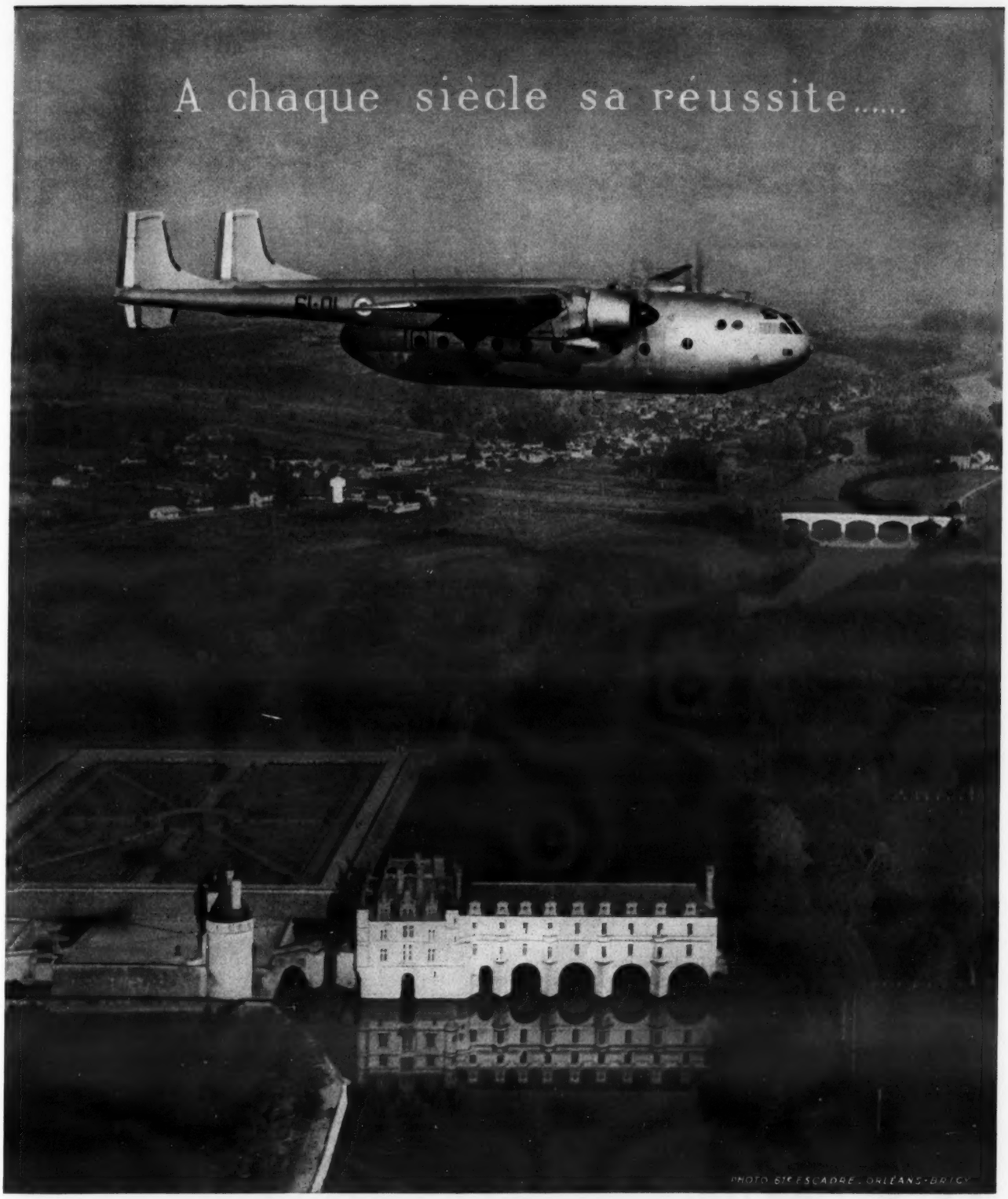

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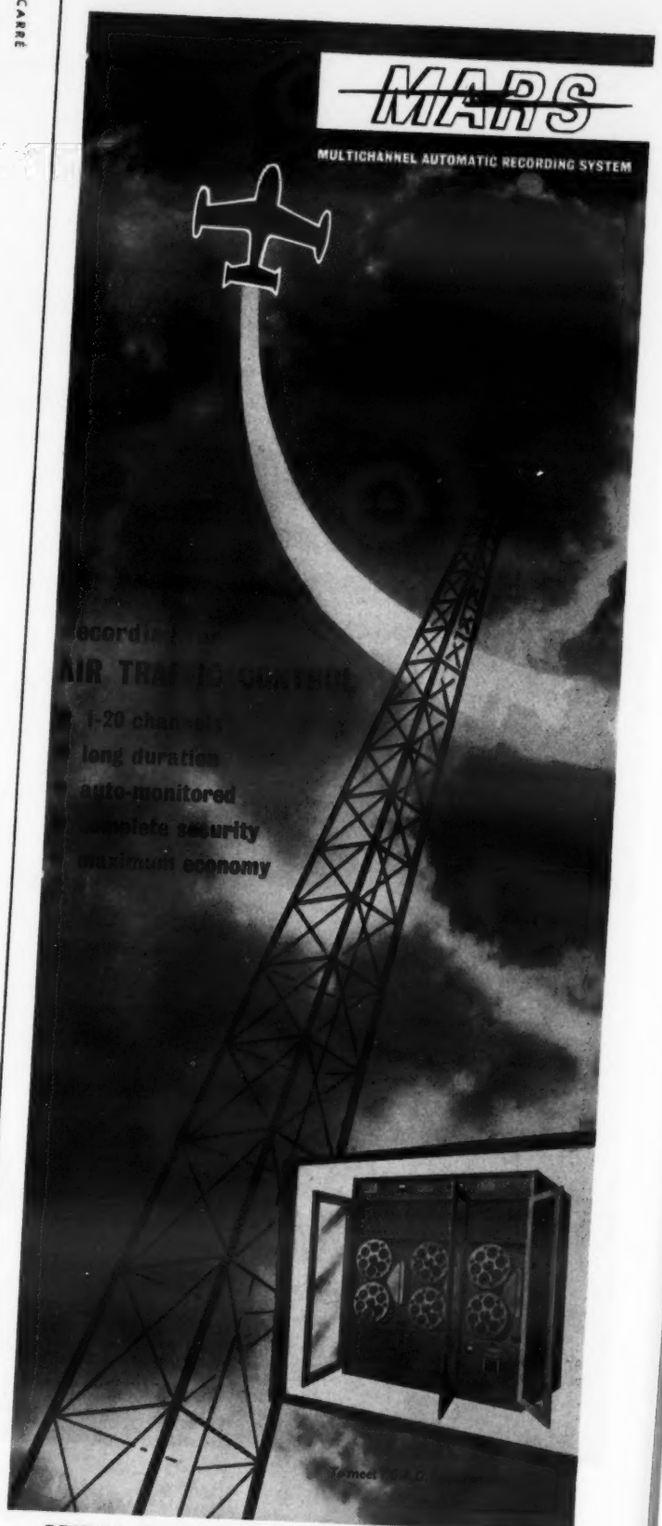

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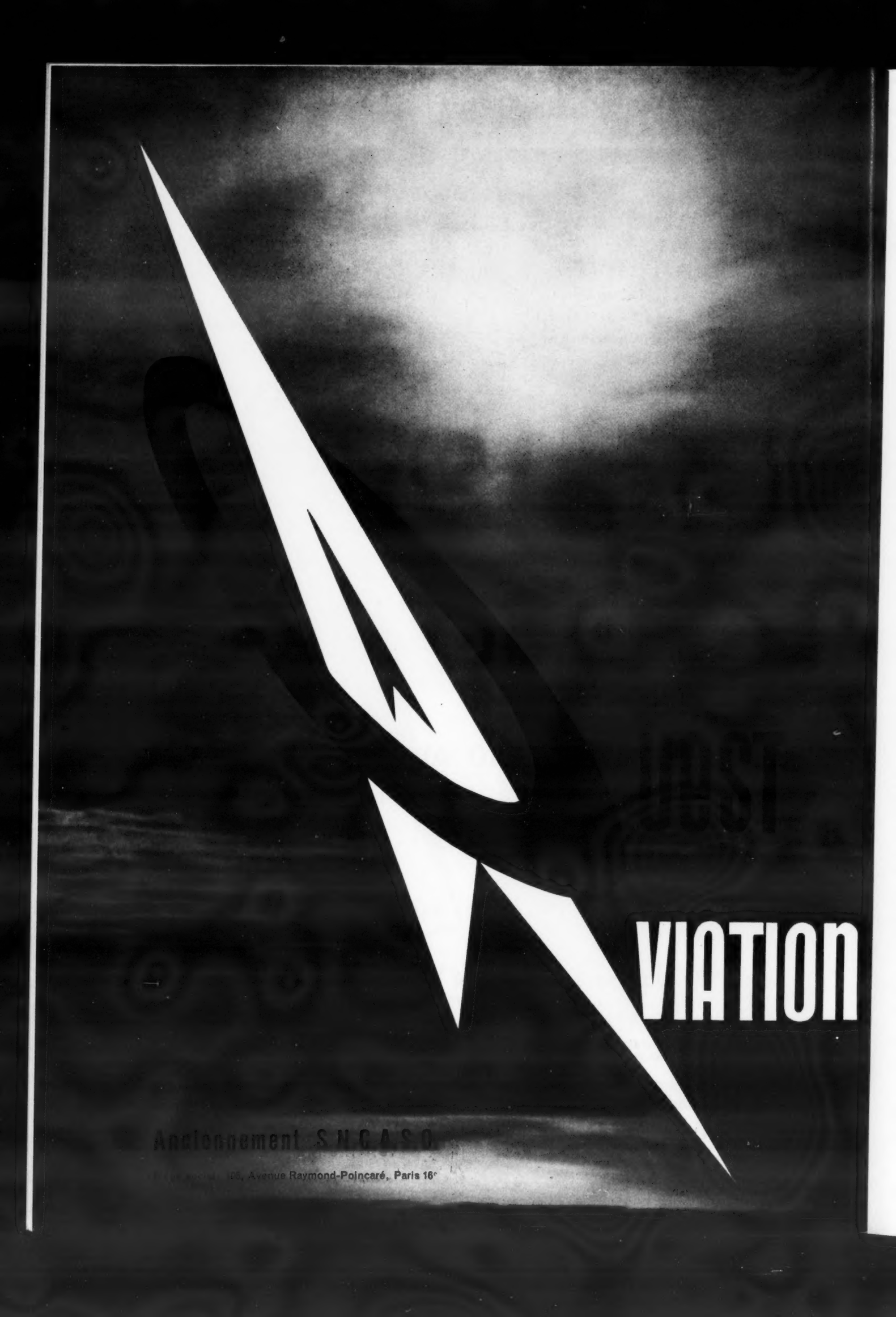
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Tunnelling for facts

The aircraft designer's most powerful weapon is still the wind-tunnel, though not quite the same sort of wind-tunnel that was good enough before Professor Mach made his name. If you are in the business of making supersonic aircraft, you must have a supersonic wind-tunnel—or more precisely a supersonic tunnel that is also usable at transonic speeds, for it is just below and just above the speed of sound that really funny things happen to the air-flow round an aeroplane. To build such a tunnel poses two problems—how to move a vast quantity of air fast enough, and how to stop shock waves choking the tunnel at high subsonic speeds so that testing becomes unreliable at and near the speed of sound.

The first problem was solved by seizing on the casual remark of an ENGLISH ELECTRIC man over lunch 'Why not use a jet engine to blow or suck the air along?' The second was more difficult to solve, but finally yielded to hard work and clear thinking. As a result ENGLISH ELECTRIC had the first sizeable transonic wind-tunnel ever built in this country. To-day, indeed, they have two such tunnels, plus a low-speed one, and are pressing on with a new tunnel to run at several times the speed of sound. Thus the ENGLISH ELECTRIC design team is in a position unique in the British aircraft industry. Not only do they have the urge to find things out on the ground, but for several years they have had the means to do so.

Design starts from an attitude of mind

'ENGLISH ELECTRIC' aircraft

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Deadline Notes

No. 11, 1956

TRANSCONTINENTAL S.A. is the name of Argentina's first private air carrier, which is to open domestic services in January 1957 from Buenos Aires to Rosario, Mar del Plata (and Montevideo) and in March 1957 to Cordoba and Salta. In May or June 1957 an international service will be inaugurated from Buenos Aires to New York, by way of Montevideo-Sao Paulo-Rio de Janeiro-Caracas, and in December 1957 or January 1958 to San Francisco. The company has already ordered five Lockheed L-1049H Super Constellations. Board of Directors: Manuel R. Masllorens (Chairman), Ing. Oscar Sassoli (Deputy Chairman), Ramon Masllorens (Secretary) and Dr. Eduardo Pizarro Jones (Treasurer). Temporary headquarters are at Lavalle 1171-9, Buenos Aires.

AEROFLOT is now operating scheduled services on the Moscow-Tashkent and Moscow-Tiflis routes, using Tu-104s in both cases. Return fares on domestic services have been reduced by 10%, and on certain routes the single fare has also been greatly lowered (by up to 60%).

HELICOPTER SERVICES are also to be operated in Italy. Exclusive rights for scheduled services are expected to be granted to a company founded by Alitalia, LAI and Fiat.

LINEE AEREE ITALIANE will shortly purchase another four Vickers Viscounts. After their delivery, LAI will be in possession of 10 Viscounts.

K.L.M. MANAGEMENT CHANGES: F. von Balluseck, Executive Vice-President - Traffic, will retire on December 31st on reaching the age limit, but will continue his link with K.L.M. as traffic adviser for another year. His successor will be M.J. van der Ploeg, at present Executive Vice-President - Finance, who in turn will be replaced by A.H. van Gelder, now his deputy. J.C. van der Kloot will become head of the Traffic Department's sales section.

COPENHAGEN'S KASTRUP AIRPORT is to be expanded by 1960 at a cost of 167,000,000 Danish kroner. The project includes construction of a 72,000,000 kroner air terminal, runway extension totalling 76,200,000 kroner and other work estimated to cost 18,800,000 kroner.

THE AIRPORTS OF 29 U.S. CITIES with populations above 250,000 all showed net operating profits for 1955, according to the Bureau of Census. Los Angeles International Airport came first with revenues totalling $2,200-000 and a net operating profit of $1,264,000. Last on the list was Columbus, Ohio, with total revenues of $200,000 and a net operating profit of $5,000.

LOCKHEED AIRCRAFT CORPORATION announces U.S. Air Force orders totalling more than $260,000,000; these cover production of C-130 Hercules turboprop military transports, spares, ground handling equipment, engineering and technical data and mobile training units for both flight and ground crews (more than $100,000,-000); production of additional numbers of F-104 Starfighters ($115,000,000) and F-104Bs ($51,000,000). The company has also received a $50,000,000 contract from the U.S. Navy for additional WV-2 Super Constellation radar aircraft.

DOUGLAS AIRCRAFT COMPANY is constructing a number of new facilities at its Santa Monica plant at a total cost of $5,000,000, to meet the growing needs of the DC-8 jet transport and missiles programmes. Major projects in the plant and equipment expansion required to speed up DC-8 production include the following: (1) a two-storey acoustics laboratory; (2) a pneumatic systems laboratory; (3) a static test facility; (4) a control systems laboratory; (5) enlargement of the electrical systems laboratory. In addition, work has begun on structures for testing guided missiles, consisting of two 60-foot towers and one 100-foot tower for proof and calibration testing of aerial weapons. A special facility for coating of aircraft parts is also being erected.

NORTHROP AIRCRAFT INC. has proposed a merger with Vertol Aircraft Corp. The proposal is based on the exchange of two shares of Northrop stock for each share of Vertol stock outstanding after the 15% stock dividend declared by Vertol recently, for payment on October 29th. Vertol's Board of Directors has unanimously authorized the management to broaden discussions with Northrop on a possible merger.

THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS has elected James H. Doolittle as its Chairman.

* From INTERAVIA's world-wide news service, including INTERAVIA AIR LETTER, the daily international aviation news digest. — No part may be reproduced without written permission.

He succeeds J.C. Hunsaker, Chairman of N.A.C.A. for the past 15 years. Leonard Carmichael, Secretary of the Smithsonian Institution, was re-elected Vice-Chairman.

INDUSTRIAS AERONAUTICAS Y MECANICAS DEL ESTADO, of Cordoba, has acquired a licence from Morane-Saulnier to manufacture the MS.760 Paris four-seat jet aircraft in Argentina. The Turboméca jet engines with which the aircraft is equipped will be imported from France.

TEN BROUSSARDS have been ordered by the Argentine Government from Société Nouvelle des Avions Max Holste. So far a total of 325 of these aircraft has been ordered.

OERLIKON MACHINE TOOL WORKS BUEHRLE & CO., Zurich, has celebrated its 50th anniversary. Founded in 1906 under the name of Schweizerische Werkzeugmaschinenfabrik Oerlikon, the company was bought in 1923 by Magdeburger Werkzeugmaschinenfabrik, and was reorganized by E. G. Bührle, who later acquired a majority interest and developed it into one of Switzerland's leading engineering and armaments firms.

INDUSTRIEWERK DRESDEN is now producing the Ilyushin Il-14, with improved interior accommodation compared with the model built in the Soviet Union. Initially it is planned to manufacture 100. The BB-152 jet transport now under development is to be put into service in a long-range 50-passenger version by the East German Lufthansa in 1960. Industriewerk Dresden has its own airport at Dresden-Klotzsche with runways capable of taking the most modern jet aircraft. The firm's subcontractors are located in a number of East German towns. Power plant, for example, are being made at Karl-Marx-Stadt (Chemnitz). - Technical Manager of the Dresden enterprise is Fritz Freundel; Chief Designer is Josef Besinger.

LIEUTENANT GENERAL A. BARETTA, Chief of Staff of the Royal Netherlands Air Force, retired on November 1st. His successor is Major General H. Schaper.

NEW GERMAN AIR ATTACHES appointed on November 1st are Colonel Hans von Ploetz (London), Lieutenant General Heinrich Seeliger (Ankara), Colonel Friedrich-Karl Schlichting (Ottawa), Major Heinz Schlockermann (Rome) and Major Hans Wolrath-Dölling (Brussels).

ITALY'S FIRST AIR ATTACHE to Bonn is Colonel Gino Callieri, formerly head of the Technical Department of the Chief of the Air Staff.

TWO NEW AIRCRAFT CARRIERS, Clemenceau and Foch, are to go into service with the French Navy in 1959. Both will have angled decks, steam catapults, up-to-date electronic equipment, mirror landing sights etc. Each will accommodate 50 naval aircraft.

THE U.S. AIR FORCE BASE AT THULE, Greenland, is to get Nike anti-aircraft guided missiles.

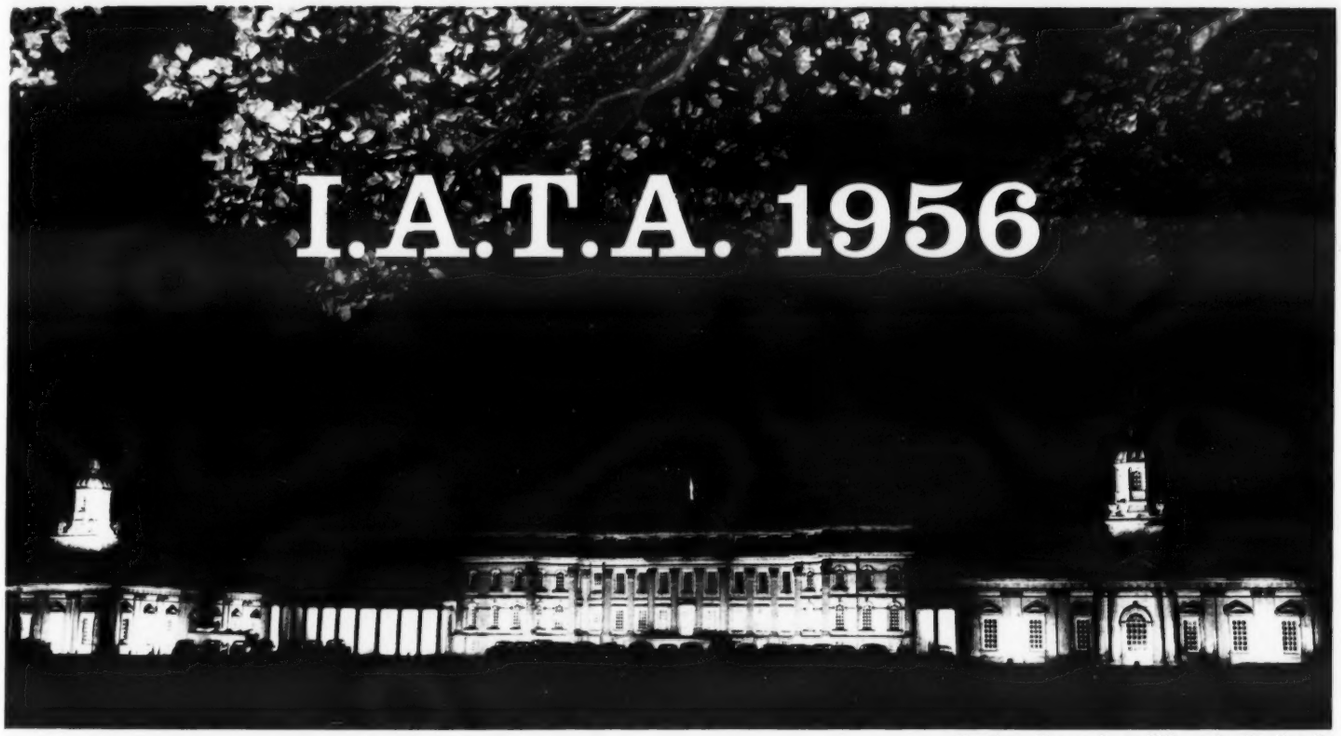
B.O.A.C. TO GET 15 BOEING 707s: The Minister of Transport and Civil Aviation Harold Watkinson announced in Parliament on October 24th that the Government had approved the purchase by B.O.A.C. of 15 Boeing 707 jet airliners powered by Rolls-Royce Conway engines. - The Corporation also revealed that urgent discussions were in progress with de Havilland on a new airliner, the D.H. 118 which it was understood would be ready for service in 1962 and would seat about 120 people. The aircraft would be able to operate with maximum economy on either the Empire or North Atlantic routes.

*

WORKSHOP BRIEFS . . .

CS2F-1 Tracker is the R.C.A.F. designation of the Grumman S2F-1 anti-submarine aircraft (U.S. Air Force designation Sentinel) built under licence by The de Havilland Aircraft of Canada Ltd. The first CS2F-1 was recently delivered to the R.C.A.F. * A new remote-controlled target drone with the designation RP-70 has been developed by Radioplane Company, Van Nuys, California. Though fitted with conventional horizontal and vertical stabilizers, the rocket-powered drone is controlled by three small vanes in front of the wing; fuselage length more than 9 ft., span approx. 5 ft. * The pre-production batch of Dassault Super Mystère B.2s is almost completed, and manufacture of components for the production models has begun at the subcontractors' plants. * Construction of a five-seat touring aircraft with two Walter Minor engines is reported from Prague. The aircraft was designed by a group working under Ladislav Smrcek and is reported to have a max. speed of 175 m.p.h. and a max. range of approx. 1,000 miles. It is to be fitted with up-to-date radio equipment of Czech manufacture. * After operating successfully on a "gyroscopic" test rig, SNECMA's Flying ATAR has now undergone a series of free-flight tests, during which it took off and landed within a circle 3 ft. in diameter. * The R-Theta navigation and interception computer is now being produced for the R.C.A.F. in quantity by PSC Applied Research Ltd., Toronto, in its new Mark II version. The use of transistors instead of tubes has reduced weight from 45 to 29 lbs. * The North American F-107 fighter-bomber has begun flight testing. * A Blackburn Beverley heavy transport recently took off with full payload of 22 tons from a 400-yard grass runway, using ten Scarab take-off rockets. Each Scarab achieves a momentary peak thrust of 6,000 lbs.

* * *



Hopetoun House – "cozy little weekend cottage".

Twelfth Annual General Meeting, Edinburgh

Most travellers arriving in Scotland instantly forget all the jokes about Scottish avarice and express their appreciation of the courtesy of the Scottish people. The 200 Delegates to the 12th Annual General Meeting of the International Air Transport Association, which took place in Edinburgh from September 17th to 21st, were no exception: scattered in the four winds today, they will be among the first to agree that the hospitality and friendliness of the proverbially dour Scots is hard to beat. While the four host airlines, British European Airways, British Overseas Airways Corporation, Hunting-Clan Air Transport, Ltd., and Airwork Ltd., could obviously not compete with the scenic attractions of such glamorous localities as Miami Beach, Cannes, Puerto Rico, San Remo, Bermuda, Geneva and other I.A.T.A. playgrounds, or with the sophisticated pleasures of Paris, London or New York, they more than made up for this deficiency by substituting Scottish customs and tradition—atmosphere by the carload. The little publicized beauty of Edinburgh, its dignified buildings and monuments contributed to the overall effect. And the weather—at its rainiest in Scotland in July and August—belied the stories one is apt to hear about meteorological conditions in that part of the world.

Atmosphere... When the delegates of the 74 I.A.T.A. member airlines, the 22 observers from 15 other organizations, the I.A.T.A. staff and—last but not least—the 120 wives and daughters of delegates, emerged from the Assembly Rooms in George Street after the inaugural session on September 17th, they were greeted by the skirls, the march and countermarch of the kilted pipers and drummers of the Edinburgh City Police Band. Delegates' wives burned up miles of cinema film, no doubt mostly out of focus, to record the event. This was a mere beginning.

On the evening of the same day the entire I.A.T.A. family of more than 400 people—including all the manufacturers' representatives trying to impress the delegates with the quality of their equipment—travelled by bus and car to the vast compound ("bigger than the Kremlin", someone said) of historic Edinburgh Castle, where they were received in the flag, armour, halberd and battle-axe bedecked Banqueting Hall by the Right Honourable Lord Strathclyde, Minister of State for Scotland, on behalf of the Government of Her Majesty who herself was residing at Balmoral Castle at the time. There followed a buffet supper in another hall; whisky (no Bourbon) flowed freely and a bulldozer was needed to get at the food. The climax came at 9:00 p.m. on the Esplanade of the Castle where the Second Dragoons of the Royal Scots Greys, the Royal Scots, the King's Own Scottish Borderers, The Black Watch, the Highland Light Infantry, the Seaforth, the Gordon and the Queen's Own Cameron Highlanders and the Edinburgh City Police Pipe Band put on a brilliant, colourful tattoo of Scottish military music which made many a delegate sense why Great Britain became a Great Power and why the Scots call themselves the Salt of the Earth. Marshal of the Royal Air Force Lord Douglas of Kirtleside, an authentic Scot, Chairman of B.E.A. and I.A.T.A. President for 1956/57, took the salute of the historic "Beating of Retreat" by the Castle Garrison.

The following day the delegates and their wives attended a civic reception by the Rt. Hon. Sir John G. Banks, Lord Provost of Edinburgh, at the City Chambers while Wednesday, September 19th, was devoted to a whole-day excursion from Gourock down the River Clyde, the Firth of Clyde, around the Kyles of Bute, the Sound of Bute to Brodick, up Gare Loch and back to Gourock. One purpose of the trip—to see the scenery—remained unaccomplished because a dense Scottish mist blanketed the area through no fault of the organizers (said one Delegate, "if it were Irish Mist, you could at least drink

it"), but the second purpose—to make the delegates get acquainted—was perforce fulfilled beyond the host airlines' wildest expectations as the "Duchess of Hamilton" sailed for nearly seven hours through the gloom.

The final social *éclat* came the next night with a dance given by the host airlines at fabulous Hopetoun House, in West Lothian on the Firth of Forth, one of the most palatial homes in all of Scotland (Air India International's Chairman J.R.D. Tata described it as a "cozy little weekend cottage") and residence of the Marquess of Linlithgow, ninth Earl of Hopetoun.

*

Another quasi-social aspect of the Edinburgh Meeting was provided by those manufacturers who have airline equipment to sell. A list of firms who were absent would be shorter than one of those who were present. United Aircraft was there in force, with a continuous cocktail party. Bristol Aeroplane threw a dinner-dance with nearly 200 covers. Lockheed had a marathon luncheon party every day, open to all comers. Napiers did the same and also had a salon where tired airline executives could refresh themselves with coffee and more indigenous beverages. Vickers-Armstrongs ran a "Viscount Room" with buffet supper and drinks on a near-24-hour basis. Fokkers invited everyone to cocktails, buffet supper and a film show. Douglas Aircraft was there, Boeing Airplane was there, Fairchild was there, Convair was there... Napiers demonstrated their extremely quiet *Eland-Convair* conversion and served lunch aboard it, Bristols eased their big *Britannia* airliner into Edinburgh's relatively small Turnhouse Airport to show its ability to operate from moderate-size fields and invited operators to go on demonstration flights...

Honour Guard was provided by air hostesses. From front: Joan Pedley, B.E.A.: Hermione MacVicar, B.O.A.C.; Barbara Green, Airwork; Lorna Gilhespy, Hunting-Clan.

Juan T. Trippe, P.A.A. (left), hands over the I.A.T.A. presidency to Lord Douglas of Kirtleside, B.E.A. Backdrop: the Douglas Tartan.

Opening Plenary Session at Assembly Rooms, George Street.

*

In between, so to speak, I.A.T.A. also accomplished the main task of the Annual General Meeting, officially in a spirit of utter harmony. However, it soon became apparent to a sensitive observer that a suspicion of malaise was pervading the sessions behind closed doors on the eve of the air transport revolution brought about by the advent of large-capacity, high-speed jet airliners. While it was difficult to put a finger on the exact source of this malaise, it seemed likely that it resulted from a combination of several factors. First, charges that I.A.T.A. is a price-fixing cartel have been levelled at the association for months and, despite I.A.T.A.'s vigorous protests, have not been silenced. Second, some of the European airlines are no doubt still apprehensive of the

I.A.T.A. Sidelights I

P.I.A. Establishes Engineering Base

When Pakistan was born in 1947 it was faced by the important problem of establishing rapid communications between the two parts of the country, separated by a distance of over a thousand miles. High priority was therefore given to reinforcing Orient Airways, the infant operator which soon after the partition of India had assumed responsibility for maintaining the air link of East and West Pakistan. Out of Orient Airways grew Pakistan International Airlines, and the operator's fleet of Convair 240's and DC-3's was supplemented by three Lockheed L-1049C *Super Constellations* for the Karachi-Dacca and Karachi-London long-range services, while orders were placed for Vickers *Viscounts* for the medium stages.

This meant that P.I.A. had to establish an engineering base to maintain and overhaul its aircraft. The company started operating *Super Constellations* early in 1954, and initially engine overhauls and engine changes were done in the Netherlands. However, the company simultaneously organized training programmes, sent technical personnel abroad for specialized training, and built up its *Constellation* engine and instrument shops.

A *Super Constellation* engine is being mounted on the test bench in P.I.A.'s Karachi workshops.

Early in 1956 it completed an extension to its engine shops at a cost of $16,800, built an engine test bed for $14,700 with a test bench costing another $15,000 and silencing equipment worth $42,000. In March 1956 P.I.A. completed its first *Constellation* engine overhaul. Since that date the company has added to its shop equipment by installing an Ultrasonic Cleaner for precision parts and other components; a machine for classification of anti-friction bearings as to their serviceability; an Ultrasonic Depth Gauge using a cathode ray tube and an electrical circuit to detect thickness of various metals.

At Karachi Airport the company is now erecting a $143,000 building which will provide permanent quarters for its Instrument, Radio and Electrical shops, the training school, catering and operations departments. A complete range of modern machines and instruments for the Karachi engineering base is on order from the U.S.A. for $600,000.

For a young country like Pakistan, with its shortage of technical know-how, equipment and manufacturing facilities, the results achieved by P.I.A. are encouraging. An indication is the gradual increase in the company's productivity, which rose from 10,184 ton-miles per employee in 1949 to 20,308 ton-miles in 1955.

Resting from their efforts.

Edinburgh Castle—"bigger than the Kremlin".

Pipers within the Castle walls.

Pipers of Edinburgh City Police Pipe Band greet the delegates outside the Assembly Rooms.

Highland dancing—"The Argyll Broadswords".

The Military Display on the Esplanade.

I.A.T.A. Sidelights II

Garuda Grows Up

Another of the world's youngest airline companies is expanding rapidly in order to meet its country's urgent transportation needs—Garuda Indonesian Airways. The distance between Sabang in the extreme west of the island republic and Merauke in the extreme east is more than 3,200 miles—about the same as London–Montreal—while the 1,500 miles-plus route from Sabang to Surabaya in East Java is comparable to the distance London–Moscow.

It was on December 29th, 1949, the day after the transfer of sovereignty by the Dutch to the Republic of Indonesia, that two Douglas DC-3's taking off from Kemayoran airfield, Jakarta, for Jogjakarta marked the birth of the Indonesian civil airline. At President Sukarno's suggestion the company was given the name of the mythological bird Garuda (eagle) which used to carry the Lord God Vishnu safely and speedily on his journeys over mountains and seas.

Civil aviation had been well established in Indonesia since long before World War II. K.N.I.L.M., a subsidiary of K.L.M.-Royal Dutch Airlines, had maintained air connections between the islands and with neighbouring countries for many years. At the close of the war the Air Transport Group of the Dutch Armed Forces and later the Interinsular Division of K.L.M. took over the task. In the second half of 1949 the Indonesian Government and K.L.M. started negotiations for the formation of a private Indonesian airline to be owned in equal shares by the Indonesian Government and the Dutch airline. A contract to this effect signed on March 31st, 1950, stipulated that after ten years the Indonesian Government would have the right to buy also K.L.M.'s shares and, if it so desired, to nationalize the company. However, in 1953 the Indonesian Government reopened negotiations with K.L.M., with the result that the Indonesians took over K.L.M.'s shares already on May 1st, 1954, for a price of 16,500,000 Dutch guilders. Garuda was fully nationalized on July 12th of the same year, although K.L.M. agreed to provide technical assistance for a period of six years after nationalization. At present Garuda has a personnel strength of 3,571; of these, 351 are foreigners (mostly K.L.M. personnel), including about 110 captains working side-by-side with 57 Indonesian captains and co-pilots. By 1960 all foreign personnel are to be replaced by Indonesian nationals, and for this purpose Garuda has embarked on an intensive training programme. In the second half of 1954 the company allocated 3,000,000 Rupiahs for this programme, a figure which rose to 5,000,000 Rupiahs in 1955 and 8,000,000 Rupiahs in 1956. The Indonesian Aviation Training School at Tjurug, 20 miles west of Jakarta, now provides Garuda with 15 pilots a year, and the programme is to be stepped up.

At present the company has a fleet of 44 aircraft, including 16 Convair 340's and 240's, 14 Douglas DC-3's and 14 D.H. *Herons*, and six more DC-3's are to be added by the end of this year. These aircraft maintain connections to 32 points within the Republic, as well as to Bangkok, Singapore and Manila.

At Kemayoran Airport, Jakarta, Garuda has established its engineering base which is responsible for maintenance, repair and overhaul of engines and instruments and today is the biggest in the whole of Southeast Asia. The company is particularly proud of its safety record, for during the seven years of its existence it has not had a single serious accident.

Evidence of Garuda's recent growth is seen in the company's traffic figures for 1954 and 1955. In 1954 it offered 33,000,000 ton-kilometres and sold 22,900,000, representing an average scheduled payload factor of 69.4 percent. This grew to 37,700,000 ton-kilometres offered in 1955, of which 28,500,000—or 75.6 percent—was sold. Passengers rose from 313,998 in 1954 to 407,942 last year, and traffic revenue from 172,600,000 Rupiahs to 231,600,000 Rupiahs.

A Garuda Convair 240 at Kemayoran Airport, Jakarta.

Garuda air hostesses.

effects on their revenues which will result from the drastic Atlantic fare cuts imposed on them through "unanimous decision" by their powerful American competitors at the Cannes Traffic Conference last summer. And third, some airlines with ambitious expansion plans are becoming restive because of what they term "restrictive practices" of American civil aviation policy (see box). The fact remains that the heads of some of the most prominent airlines were conspicuous by their absence.

The "cartel" ghost will probably be difficult to lay. While I.A.T.A.s' Annual General Meeting was taking place, the London *Evening Standard* devoted a leading article to the subject under the heading, "The Bad Truce". It said, in part: "I.A.T.A. consistently denies that it is either a cartel or a price-fixing association, and claims that its purpose is simply to promote 'safe, regular and economic air transport'. But it is a fact that the fares charged by different airlines for the same route are always virtually identical. And that any changes in the level of the fares are negotiated by the members of I.A.T.A. among themselves. Of course, the price of air transport has been going down. But has it gone down as quickly as it would have done without the price-fixing powers enjoyed by I.A.T.A.?" The Association's many useful functions, the paper continued, do not justify the elimination of competition. "Efficient airline operators should be allowed to pass the benefits of their efficiency on to the passengers—by lowering fares. Until this is possible, the Association, despite its denials, will certainly be regarded and condemned as a price-fixing cartel."

To this, I.A.T.A.'s able Director-General, Sir William P. Hildred, opposes the following arguments: (1) Whereas a cartel is designed for the benefit of a few, I.A.T.A. has never limited its membership; (2) whereas a cartel stifles competition, I.A.T.A. members engage in a wide variety of competition, between themselves, with other scheduled operators who are not members of I.A.T.A., with non-scheduled operators and surface carriers; (3) whereas a cartel divides the market, I.A.T.A. has nothing to say about the market—routes are designated by Governments; (4) whereas a cartel controls production, I.A.T.A. can say nothing about frequencies or capacity or the type of aircraft to be used; (5) whereas a cartel fixes prices, I.A.T.A. can only make recommendations in respect of international fares and rates (recommendations which, however, are invariably accepted by Governments. -Ed.-); (6) whereas a cartel operates behind closed doors, I.A.T.A. operates openly, its recommendations are formal and written and must be approved by Governments.

Delegates in the Banqueting Hall, Edinburgh Castle.

*

Six I.A.T.A. Committees reported to the Annual General Meeting on the year's work—Executive Committee, Technical Committee, Traffic Conference, Legal Committee, Facilitation Advisory Committee, Financial Committee. The overall impression gained from their reports—compared with that of the 1956 A.G.M. in New York, which rocked with the rapid-fire announcements of massive jet and turboprop aircraft orders—is that in the past twelve months I.A.T.A. has put in some solid work to prepare for the coming jet era.

The *Technical Committee,* under the Chair-

Gilbert Périer, Sabena Chairman, and Prof. John C. Cooper, I.A.T.A. Legal Adviser.

Warren Lee Pierson, T.W.A. Chairman, and Sir Leonard Isitt, Chairman of Tasman Empire Airways and New Zealand National Airways.

F. von Balluseck, K.L.M. Executive Vice-President (Traffic) and Per A. Norlin, S.A.S.

Sir Hudson Fysh, Qantas Chairman, and Juan T. Trippe, outgoing I.A.T.A. President and P.A.A. President.

Bo Björkman, Air Research Bureau; J. W. S. Brancker, I.A.T.A. Traffic Director; P. C. F. Lawton, B.E.A. Commercial Director.

Capt. J. W. G. James, B.E.A. Flight Operations Director.

Winston Guest, Guest Aerovias Mexico President; Willis G. Lipscomb, P.A.A. Vice-President (Traffic and Sales).

Conspirators? I.A.T.A. Director-General Sir William P. Hildred, Soviet Air Attaché Col. Anton Konstantinov, Lord Douglas.

Family Group: Cesar Gomez Lucia, Iberia General Manager; Señora Gomez Lucia; Juan B. Viniegra, Secretary General; Señorita Delgado; Señor Don Tomas Delgado Perez de Alba, Iberia President and I.A.T.A. President-elect for 1957–58.

Grant W. G. McConachie, C.P.A.L. President.

J. R. D. Tata, Air India International Chairman and I.A.T.A. President-presumptive for 1958-59.

Seijiro Yanagita, Japan Air Lines President, and Mrs. Yanagita.

Prince Marcantonio Pacelli, L.A.I. President.

Sir William P. Hildred, passing hat for higher airline profit margins.

Major J. R. McCrindle, B.O.A.C. Adviser on International Affairs; A. Laurence Young, I.A.T.A. Secretary.

Count Nicolo Carandini, Alitalia, and the Countess.

Dr. M. Soetoto, Garuda President, and Mrs. Soetoto.

Tête-à-tête: S. D. (Sam) Irwin, Curtiss-Wright Vice-President and General Manager of Export Division, with Lady Douglas.

Dark duet: C. Frederik C. Meuser, Lockheed Aircraft, disguised as an Austrian, and Louis Lesieux, Air France Director-General, disguised as a Scot.

Armando Irungaray, Aerolineas Argentinas Legal Adviser, and Mario Sanchez Claria, Aerolineas Director.

Lockheed family: Ed Fife, Director of Technical Sales for Europe, Africa, Middle East; Mrs. Fife; Capt. C.F.C. Meuser, Director of Sales for Europe, Africa, Middle East; Mrs. Meuser; Miss Meuser.

I.A.T.A. Sidelights III

South African Airways has Come of Age

South African Airways celebrated its twenty-first birthday in February last year and, though even today a relatively small airline by world standards, it can look back on a period of growth from a mail service between a few cities within the borders of the Union of South Africa into one of the world's reputable airlines. Factors contributing to this growth have been the great distances and the many sparsely populated areas of the Union, the long lines of communication to other Commonwealth countries, as well as the progressive equipment policies consistently followed by S.A.A.'s management. The line today operates an intensive domestic network and regular flights to neighbouring countries, in addition to a daily trunk service between Johannesburg and London which includes Cairo, Athens, Rome, Paris and Frankfurt within its scope. A service between Africa and Australia is planned for the near future.

Regular commercial air services were introduced in South Africa in August, 1929, when a company called Union Airways opened mail schedules between Cape Town, Durban and Johannesburg. In 1931 the South African Railways Administration was authorized to operate its own aircraft for the transport of passengers and goods, but it was not until 1934 that the Railways took over control of Union Airways and formed South African Airways as the Government's chosen instrument.

From the outset S.A.A.'s equipment policy has been progressive. Before the war the company acquired Junkers Ju 52 three-engined and Junkers Ju 86 twin-engined transports which later were replaced with Lockheed L-18 *Lodestars*. Soon after the war Douglas DC-4s were placed into service, and these were followed by Lockheed L-749 *Constellations* and L-1049 *Super Constellations*. S.A.A. was the first airline outside of the United Kingdom to use the *Comet*, and this year it became the first airline outside the U.S.A. to introduce the new Douglas DC-7B. It has also ordered seven Vickers 810D *Viscounts* which are to become available in 1958 for domestic and over-border services.

Like that of many other airlines, S.A.A.'s early development was stopped by the outbreak of war in 1939. S.A.A. aircraft and air crews were transferred to the South African Air Force for bomber, anti-submarine and transport duties. The first air raids against the Italians in Abyssinia were carried out by S.A.A. aircraft.

In 1944 the trend in the hostilities made it possible to release some aircraft for the resumption of commercial services on a restricted scale, and from then on S.A.A.'s progress has been uninterrupted. The Johannesburg–London service was inaugurated on November 10th, 1945, and on July 8th, 1946, the company introduced another service to London via Nairobi, Khartoum and Castel Benito. By the end of 1947 its fleet had grown to 41 aircraft. However, during the past few years most of the smaller aircraft have been sold and replaced by larger machines; today only 19 aircraft are operating on scheduled services—but the number of available seats (885) has been more than doubled.

The company's evolution over the past twenty-two years is illustrated by some of its traffic figures: in 1934 it carried 3,074 passengers; for the 1955–56 fiscal year the figure was 246,356. In the first year of operation it flew 266,494 aircraft miles; by 1955–56 this had risen to 6,545,962 miles. In 1951–52 South African Airways recorded a deficit of £278,753, for 1954–55 a profit of £580,963—and the upward curve is showing no signs of levelling off.

A S.A.A. Douglas DC-7B over Johannesburg.

manship of Captain Anselme Vernieuwe, of Sabena, reported that as regards the introduction of jet transport there was now universal agreement as to the shape of the problem confronting the airlines. It urged improvements in the present systems of air traffic control and the development of even more efficient systems for the first decade of jet transport, 1961 to 1970. It demanded self-contained navigational aids independent of ground stations and proposed the establishment of a Central Air Traffic Control Authority for Europe for the coordination of military and civil ATC.

To airport authorities it suggested that in cases where runway extensions were necessitated by the new jet aircraft, a compromise could be reached in the form of stopways, i.e., areas beyond the end of the runways in which aircraft could be stopped after an interrupted take-off. Because they would be used very rarely, they could be built more cheaply than a full runway surface. The Technical Committee also warned that because jet operating economy will be particularly sensitive to "lost ground time", terminals must be able to provide "rapid turn-around of aircraft and smooth functional flow of passengers, crews, cargo and baggage." I.A.T.A. had developed a 150-page reference document of principles and guidance material for the design of aircraft buildings and aprons and was going on with further studies of fixed servicing installations, mechanical conveyor systems for loading, and special problems related to jet aircraft.

Lucien L. Ambord, Swissair Director of Traffic and Sales; multilingual W. de Mier, K.L.M. General Manager in London.

René Briend, Air France's Hon. Director-General; and *Interavia's* Editor and Publisher, Dr. E. E. Heiman.

R. McKean, B.E.A. Manager for Scotland, brilliant organizer of the Scottish A.G.M.; A. J. Quin-Harkin, Manager, I.A.T.A. Clearing House; Lady Hildred.

The Committee also dealt at length with such urgent problems as visual aids for depth perception during landings, vertical separation of aircraft and reliable devices to ensure such separation, air-ground communications, air navigation regions, and helicopters.

The report on the *Traffic Conference*, presided over by K. G. Granville, of B.O.A.C., made special mention of the new low-cost Atlantic fares (20% less than present tourist fares) which will be introduced on April 1st, 1958, and the $ 425 fifteen-day round-trip excursion fare (taking New York–London as the basis) which went into effect last October 1st.

The *Legal Committee*, under W. A. Steenstra-Toussaint, of K.L.M. noted the efforts I.A.T.A. is making to facilitate the interchange of aircraft in international air transport and revealed that a special subcommittee of French, South African, American and British airline legal experts, under the Chairmanship of Maurice Lemoine, of Air France, had been named to study the problems of public and private air law involved. In the United States, for example, interchange of aircraft, with or without crews, by charter or hire, had made possible greater

Charmer: Mrs. Walter Berchtold, wife of Swissair President.

Mrs. Warren Lee Pierson.

Lady Douglas.

Mike E. Oliveau, Director, European Division, Douglas Aircraft.

J. F. Dempsey, Aer Lingus General Manager.

E. O. Cocke, T.W.A. Senior Vice-President (Sales).

S. K. Kooka, Air India International Traffic Manager.

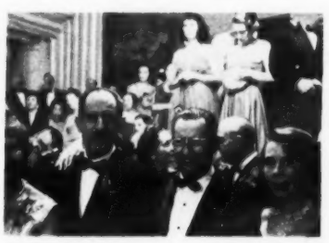
Watching the corrida, a Latin beauty.

English rose: Judy Munt, I.A.T.A. London.

Mrs. James S. Lee. "Now don't you dare!"

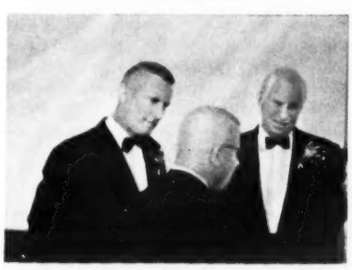
James S. Lee, Executive Vice President, United Aircraft Export Corp.; Harvey P. Jolly, Vice President; Mrs. J. S. Lee.

Armando Irungaray, Aerolineas Argentinas, and a charming B.O.A.C. hostess.



Jolly good fellows. Prince Marcantonio Pacelli, L.A.I., and E. O. Cocke, T.W.A. At left, Princess Pacelli; at right, Mrs. Cocke.

Eyes . . . left, or Beauty and the Baron. Lord Douglas and Joan Pedley, both of B.E.A.



Peter Redpath, Vice President (Sales), Canadair Ltd.; Lt.-Gen. Leon Grandell, President, Finnair; I. Geoffrey Notman, President, Canadair.

Hmm . . . Derek H. Wood, *Interavia's* London Editor, with Miss Frankie Watson, B.E.A.

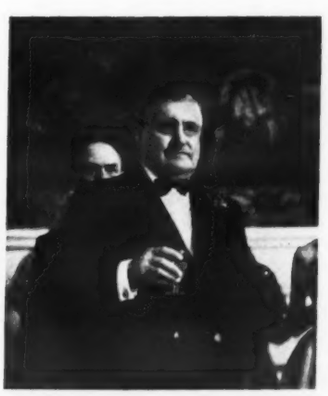
I.A.T.A. flowers. Left, Mrs. Lorraine Burrows.

Scottish folk dancing.

A. D. Bennett, Iraqi Airways Technical Adviser; partner not identified.

Centre, front: J. B. Connelly, Boeing Airplane's Vice President and General Manager of the Transport Division, and Ken Luplow, Boeing European Manager.

Air Commodore C. S. Cadell, Managing Director, International Aeradio, and Mrs. Cadell. Flirting in left background: S. Ralph Cohen, I.A.T.A. Public Relations Officer.



I.A.T.A.'s 1956-57 President.

utilization and operating economy. The need for interchange was particularly urgent in Europe, but on international routes and between companies of different nationalities interchange was complicated and often prevented by questions of nationality and registration of aircraft, control over airworthiness and licensing of crews, and liability.

The *Facilitation Advisory Group* report, drafted under the chairmanship of John A. Paine, of P.A.A., again drew attention to the importance of reducing ground time in the operation of jet transports. At present the elapsed time on the New York-London run is 14 hours 10 minutes and the ground time at terminals 2 hours, or about 14 percent. Hence, in order to maintain an equivalent relationship for jet transports, which will require an elapsed time of about six hours between New York and London, ground time will have to be cut to about 50 minutes—or one hour at the most.

The *Executive Committee* report, presented by Major J. Ronald McCrindle, of B.O.A.C., recorded that I.A.T.A. now has 69 active and

Max Hymans (centre), Air France Chairman, and Robert Montarnal, Air France Deputy Director-General (Economic Affairs).

Friendship. R. James Pfeiffer, Executive Director of Customer Relations, Fairchild Engine and Airplane Corp.; Mrs. F. J. L. Diepen; F. J. L. Diepen, Commercial Director, Fokker aircraft company.

Lucien L. Ambord (far left), W. de Mier, Capt. C. F. C. Meuser; Sir George Cribbett, B.O.A.C. Deputy Chairman; John Saunderson, head of Aviation Department, The British Petroleum Co. Ltd.

I.A.T.A. Sidelights IV

K.L.M.'s Battle for U.S. Routes

Critics of U. S. foreign civil aviation policy nearly always attack the so-called "quid pro quo" concept which forms one of the cornerstones of this policy. Also termed "reciprocity" or "an equitable exchange of economic benefits", it means an exchange of equivalent access by the air carriers of one country to the international air transport market of the other country. Opponents of this policy—and they are all those foreign airlines who are seeking a larger share of the U. S. international air traffic—deny that the "quid pro quo" principle results in an equitable exchange of economic benefit because, they say, in its application it is strictly limited to air transport as if the air transport industry were "operating in an economic vacuum". They claim that the "quid pro quo" concept is in effect a restrictive protectionist principle inasmuch as it means that one country should not accord to carriers of any other country traffic rights in excess of those which it must barter in exchange for the traffic in other countries which it needs for its own carriers. Thus, they argue, if country A does not desire traffic rights for its own carriers in country B, the latter has no basis for obtaining traffic rights for its airlines in country A.

The question was much debated in Edinburgh in the third week of September—first behind the scenes and then in public. The main practical example cited during these discussions were the difficulties K.L.M. —Royal Dutch Airlines is encountering in realizing its plans to extend its Amsterdam–Montreal service to Chicago and to Los Angeles; to make Houston, Texas, a port of call on its Amsterdam–Montreal–Mexico City service; and to open a Dutch Curaçao–New York service—a route already operated by Pan American World Airways. After months of wrangling with U. S. State Department air transport experts the Dutch negotiators last August returned empty-handed from Washington, and at Edinburgh some of K.L.M.'s top executives openly expressed their disillusionment.

Pointing out that since 1946 his company has bought about $230,000,000 worth of aircraft and equipment in the United States, K.L.M. Executive Vice-President L. H. Slotemaker on September 18th charged U. S. civil aviation policymakers with "unfairly" demanding far more from their European counterparts than they were prepared to give in return. K.L.M. and other European carriers, he said, were quite disturbed because the U.S.A. had changed from an advocate of "freedom of the air" in 1944 to "protectionism" in 1956. The European Airlines' main complaint was that U.S. airlines had obtained traffic rights in most countries in the world, whereas the Americans had been reluctant to grant European airlines rights to use more than a few U. S. airports. "European carriers are getting so fed up that they feel they ought to hit back," Slotemaker told United Press. "They could do it easily by reducing frequencies of U. S. flights to European points—and in fact have done so. Italy and India both have cut the number of T.W.A. and P.A.A. flights permitted into their airports," he added.

These were strong words, especially as they were voiced at the Annual General Meeting of a body notorious for its "unanimous decisions". Also, they did not fail to stir up a minor dust storm on both sides of the Atlantic, with the result that even the daily newspapers suddenly discovered an intense interest in international civil aviation politics.

In order to explain its point of view to the American newspaper public, K.L.M. then organized an unprecedented press conference. Twenty-five hours after the installation of the new trans-Atlantic telephone cable K.L.M. President I. A. Aler on September 26th put his case to sixteen newspaper and magazine reporters in five major U. S. cities in two separate sessions lasting 45 minutes each.

"What does technical progress mean for air transport if the international air doors are unreasonably kept shut or will be opened only a short way with a lot of pushing and shoving, and with all the risks of discrimination?", General Aler asked from his desk in The Hague. "Unilateral restriction of commercial air transport is particularly out of place in the N.A.T.O. partnership, and a policy of equal treatment must be adopted as soon as possible by all airfaring nations." General Aler explained that K.L.M.'s requests, which the company considers modest in the light of recent developments, had been refused on the grounds that there was no balance of economic benefits between the United States and the Netherlands in matters of commercial aviation. He conceded that American air carriers did not have the same intensive operations in the Netherlands as K.L.M. is conducting from the U.S.A., but he pointed out that "you have the same opportunities if you wish to make use of them." In response to a specific question as to whether he thought that pressure by American flag airlines was responsible for the rejection of his company's applications, K.L.M.'s President said that he had discussed the matter with the heads of seven U. S. airlines, and all had said that they would fight the K.L.M. proposal. He added that other foreign carriers—such as S.A.S.—had rights to carry passengers from Los Angeles to Europe. K.L.M. should have the same privileges, and such traffic would not be competitive with any U. S. airline. General Aler concluded the conference by repeating his "strong belief" that the U. S. would ultimately approve his company's route applications. The U.S.-Dutch talks would probably be resumed "sometime around November" after the U. S. Presidential elections, so "that we can be flying by next April".

K.L.M.'s unorthodox methods of emphasizing the importance of its operating plans provoked the principal spokesman of the U. S. air transport industry into issuing his own statement on the same day. Stuart G. Tipton, President of the Air Transport Association of America, curtly noted that "...the Dutch should be the last to complain about the aviation policies of the United States Government. U. S. Government policy has been taking care of the interests of the largely Government-owned Dutch airline since 1946. Generous U.S. policies have permitted the Dutch airline to build a world-wide network on American traffic, whereas the Netherlands' own traffic could not support the extensive Dutch operations. Examples from U.S. Government figures:— American-Flag airlines in 1955 took $109,000 out of Amsterdam, and the Dutch airline took $12,849,000 out of New York—a ratio of about 130 to one; and during 1955 American-Flag airlines carried 432 passengers out of Amsterdam, while the Dutch airline was carrying 41,895 passengers out of New York... The Dutch airline receives full equality with American flag airlines in the American market from New York to Miami, two of the world's greatest air transport gateways. After all this, it is astonishing to hear our Government's policy referred to as restrictive, or to receive threats of retaliation abroad against American-Flag airlines."

The ink of Mr. Tipton's answer had scarcely dried when—at the end of the same 26th of September—K.L.M.'s own point of view was once again put forward against the broader background of the general economic relationship between the U.S.A. and the Netherlands.

"I regret that in his statement Mr. Tipton looks only at the aviation aspect of the relationship between the U.S.A. and the Netherlands," said K.L.M.'s Manager for North America, D. J. Koeleman, "as this is only part of the entire economic relationship between the two countries. It seems immaterial who owns K.L.M., as it is operating as a private company, has been non-subsidized since the war and has been paying dividends for the last three years to its shareholders.

"Mr. Tipton states that the U. S. Government has been taking care of the interests of K.L.M. and that its generous policy has permitted the company to build a world-wide network on the basis of American traffic.

"First of all, we fail to see how any policy of the United States could have helped K.L.M. to build a world-wide network. We have received traffic rights for routes from territory belonging to the Netherlands Commonwealth in the Antilles (West Indies) to

Miami, and traffic rights between Amsterdam and New York. American carriers have exactly the same access to these routes as K.L.M. These routes can certainly not be called a world-wide network.

"Secondly, one cannot speak of traffic 'belonging' to one country or another, as traffic can only be moved if there is a point of departure and a point of arrival—obviously in two countries as far as international traffic is concerned. The nationality of passengers is immaterial and has never been brought forward in any treaty or during international negotiations. The only determining factor is the points of departure and arrival, while the choice of the means of transportation is left to the public.

"If Mr. Tipton is referring to the much-appreciated aid which the Netherlands received after World War II from the United States, for which the Dutch people are still extremely grateful, I would remind him that the Netherlands was the first country to inform the U.S. Government that it felt that it had had enough help and would prefer to stand on its own feet from then on.

"As to figures quoted by Mr. Tipton, I would state again that both American lines and European carriers have exactly the same access to the traffic flows involved. In 1955 a total of 281,801 passengers were carried from the United States to Europe by all airlines concerned. These were not only American citizens but all nationals, originating either in the United States or returning from the U.S. to their own countries. Of these, the two United States flag airlines carried 148,971 passengers, the rest being carried by the ten foreign carriers involved in this traffic. It should also be stated that airline companies are rendering service to the public and that the public should be entirely free to make its own choice.

"Contrary to what Mr. Tipton says, K.L.M. has not received full equality with other carriers in the American market. Various other airlines are now operating with increasing frequency directly to Europe from points other than New York. I quote: Boston, Philadelphia, Detroit, Chicago and Los Angeles.

"By not extending K.L.M.'s traffic rights to points other than New York—as far as trans-Atlantic traffic is concerned—in effect the U.S. Government curtails my company's right obtained in 1946 because all Europe-bound traffic, which is now moving out of other points, too, was then channelled through the New York gateway.

"Mr. Tipton further talks about threats of retaliation which have been expressly denied by General Aler in his statement. General Aler only thought it his duty to caution our American ally and friend that a continuation of the present protectionist policy might well boomerang in the future, but he just as expressly stated that the Netherlands will never apply retaliations as this would not only be contrary to Holland's aviation policy (unchanged in the past 37 years) but also be alien to the national character of the Dutch.

"Coming back to the relationship between the Netherlands and the U.S., it should be mentioned

I. A. Aler, President of K.L.M.-Royal Dutch Airlines.

Stuart G. Tipton, President of the Air Transport Association of America.

that we have been living for centuries on trade and the rendering of services to the world. As explained by General Aler in his statement, we are only a small country without natural resources. In 1955 we imported almost $500,000,000 worth of goods from the United States, while the United States imported only $150,000,000 worth of goods from us. This gap of $350,000,000 has to be filled somehow. The Netherlands people feel very strongly that this should not be done by aid from the American taxpayer, as was the case in the postwar years, but rather through fair trade and in fair competition."

While these statements—all perfectly courteous in tone—certainly spotlighted the efforts of one of the world's most efficient airline companies to expand in its own interests and in those of its hard-working country's post-war economy, it is nevertheless true that exchanges of this kind tend to arouse irritation among the parties involved in them—which would hardly be conducive to creating the serene atmosphere necessary to hammer out an acceptable compromise in international negotiations. Indeed, irritable words were not long in coming, even though they emanated from quarters directly involved in the dispute—the U.S. airlines—and not from the State Department negotiators responsible for the Government-level appraisal of the situation.

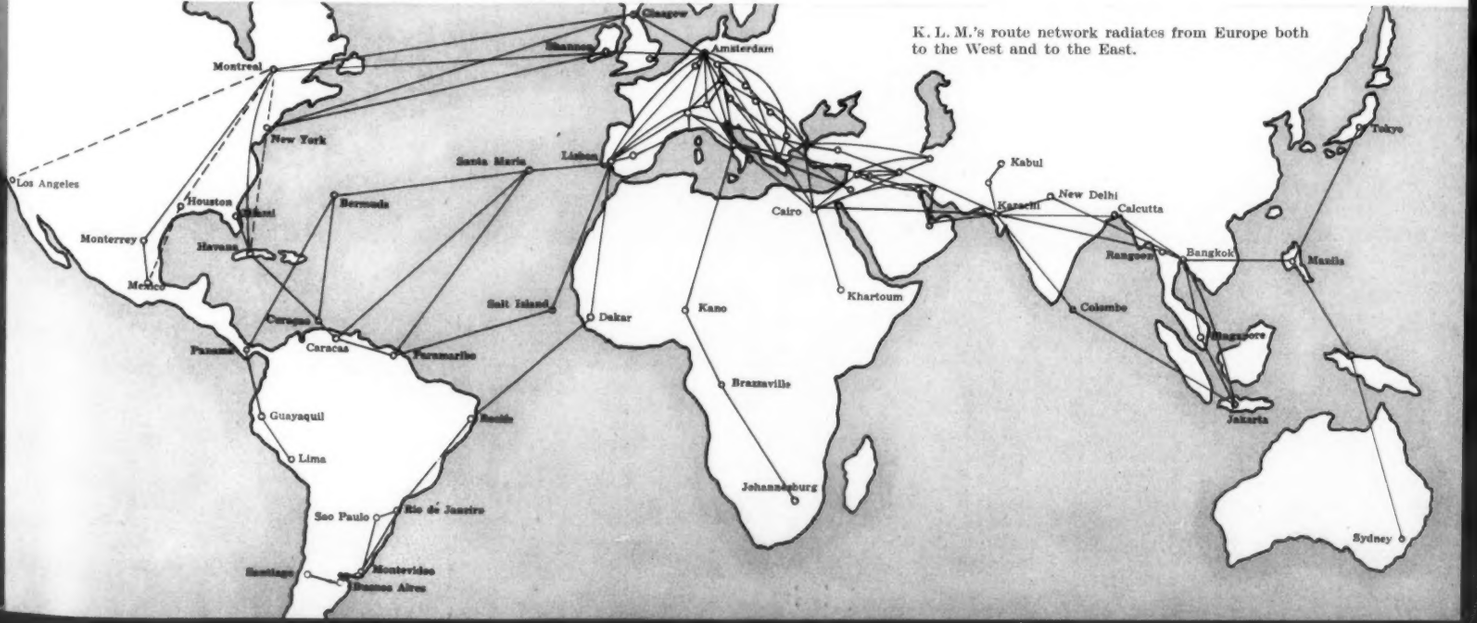
Speaking before a meeting of public relations experts at Madison, Wisconsin, on September 28th, Willis Player, Vice-President-Public Relations of the Air Transport Association of America, reiterated A.T.A.'s thesis that the U.S. Government had "traditionally preserved a liberal, even generous, policy of giving airlines of other countries access to the American market"—so far as international services are concerned—"although no other country can offer our airlines a market anywhere near so large as that we offer the rest of the world. A great many people think, however, that our rights should be asserted as vigorously as other countries assert theirs and that foreign flag airlines should not be accorded preferential treatment in U.S. controlled areas.

"In that connection, our own Government would quickly—and properly—discipline any American-Flag airline which sent its emissaries swaggering about a foreign countryside to wage a campaign of vilification against the aviation policies and duly constituted regulatory authorities of a foreign country. Yet, recently the Dutch airline—a notable beneficiary since 1946 of generous U.S. policy—chose to support its negotiations with a campaign over the head of our own Government. And when negotiations, not unnaturally, failed to achieve the excessive demands of the Dutch airline, that company embarked on a campaign of public denunciation, here and abroad, of American policy, American-Flag airlines and, in effect, the U.S. Government.

"The campaign included charges which, I regret to say, were misleading to the verge of dishonesty. Since most Americans do not regard this country as a Dutch colony (! – Ed. –), the temptation to retaliate in kind has a strong emotional appeal. In plain fact the Dutch airline is so heavily dependent upon American traffic that its essential prosperity depends upon U.S. Government policy . . . The U. S. Government (should) suggest to the Dutch Government that it instruct its airline to conduct itself as the Dutch expect our airlines abroad to conduct themselves—particularly since the Dutch airline is largely Government-owned . . ."

There, at the time of writing, the verbal duel between K.L.M.-Royal Dutch Airlines and the representatives of the entire powerful U. S. airline industry rests. (Here it seems permissible to wonder what tone A.T.A. of America would use if it were arguing with something called A.T.A. of Europe.)

By the time these lines appear in print the U. S. Presidential elections will be upon us. After that, U. S. and Dutch Government negotiators may sit down together again in Washington's "Foggy Bottom" and work out a "unanimous compromise".



K. L. M.'s route network radiates from Europe both to the West and to the East.

5 associate members. Seabord & Western Airlines (New York), Civil Air Transport (Taipei, Formosa), and Eastern Air Lines (New York), have become active members during the year. Airwork Ltd. (London), on the cessation of all its international services, has transferred from active to associate status, while Colonial Airlines (New York) has been absorbed by Eastern. The Committee said that it hoped the addition of C.A.T. "will influence other carriers in the Orient to join the Association".

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Jets, jets—the dominant note of every meeting of air transport experts these days. Sir William Hildred, in his introductory remarks, noted that anything between 200 and 300 jet aircraft will be added to the fleets of the airlines in the next few years, as well as many other types, and expressed confidence that by 1960 increased traffic will fill these aircraft. Lord Douglas, of B.E.A., who took over the 1956–57 I.A.T.A. presidency from Juan T. Trippe, of P.A.A., made a special mention of the noise problem resulting from the introduction of the new equipment. And John D. Profumo, Parliamentary Secretary to the Ministry of Transport and Civil Aviation, urged the delegates to see to it that some of the technical advances being made in aeronautics should be directed to preventing further encroachments on the land which must be taken for runways and airports.

One question much in the minds of I.A.T.A. Delegates was raised by Juan Trippe when he alluded to the West's air transport relations with the Soviet bloc. He recalled that at the Annual General Meeting in New York last year he had referred to "that large portion of the globe which has hitherto been substantially closed to the benefits of international air commerce" and continued: "It was suggested that an early application by (the Soviet) Aeroflot for admission to I.A.T.A. would be convincing proof on the part of the Soviet leaders that they were really willing to lift, for tourist travel, the Iron Curtain which has so long separated the people of the West and the Communist World. I can only reiterate a sincere hope that the year 1957 will show clearly that Aeroflot desires to participate in international civil aviation and in I.A.T.A."

In the light of this invitation, the two-day visit to Edinburgh by the Soviet Air Attaché in London, Colonel Anton Konstantinov, was much remarked. Questioned about the visit, Lord Douglas denied that he had conducted any negotiations with the Attaché, but as soon as Aeroflot had sufficient suitable aircraft (i.e., jets.-Ed.-) he expected permission for B.E.A. to fly to Moscow and Aeroflot to fly to Britain. Aeroflot might join I.A.T.A. at that time. The chief of Aeroflot, Marshal Zhavoronkov, would come to London for discussions shortly.

On the last day of the Annual General Meeting, September 21st, a plenary session approved I.A.T.A.'s budget for 1956–57 (revenue of $ 927,100, expenditure of $ 1,157,700 and an appropriation from surplus of $ 230,600), confirmed a number of appointments to its Committees—and prepared the ground for its 1957 Annual General Meeting.

The Spanish airlines Iberia and Aviación y Comercio invited I.A.T.A. to hold its 13th A.G.M. in Madrid (in the week beginning September 16th, 1957), and Iberia's President, Señor Don Tomas Delgado Perez de Alba, was elected President of I.A.T.A. for 1957–58. As an unusual event in I.A.T.A.'s history, an invitation for the 1958 A.G.M. came forth at the same time: J.R.D. Tata, Chairman of Air India International, asked I.A.T.A. to come to New Delhi in October of that year, a proposal which was accepted. Not to be outdone, Japan Air Lines in turn extended an invitation for the 15th Annual General Meeting to be held in 1959 in Tokyo. Go East, young man...

The final act of the meeting consisted of an expression of thanks to Edinburgh, the host airlines—and to Sir William Hildred, who has held the post of I.A.T.A. Director-General for ten years. And while these A.G.M.'s have sometimes been called the "annual beatification of Saint William Hildred" and I.A.T.A. a "mutual benevolent society", there is no doubt that these meetings serve a useful purpose in bringing the world's air transport leaders together and stimulate them to prepare for the future.

*

When the delegates, observers, wives and daughters of delegates emerged from the Assembly rooms in George Street, Edinburgh, after the final session on September 21st, they were bidden farewell by the skirls, the march and counter-march of the kilted pipers and drummers of the Edinburgh City Police Band. Delegates' wives burned up miles of cinema film. Atmosphere...

I.A.T.A. Sidelights V

The Diaper-Changing Derby

I, too, we were told by our Favourite Air Hostess in Edinburgh, can contribute something to your I.A.T.A. issue—the official results of the International Diaper-Changing Derby which was held in Tokyo the other day, as I told you in last month's issue.

The event was presided over by Mrs. Shigeko Higashikuni, who is a former Imperial Princess, and was stop-watched by Mrs. Seijiro Yanagita, wife of Japan Air Lines' President; Mrs. Joseph You, wife of the Sales Manager of Civil Air Transport, and Mrs. Edward E. Swofford, wife of P.A.A.'s regional director.

Esmeralda says that the stars of the show were the six brats. They took their ordeal in their stride with an aplomb reminiscent of Lord Bolingbroke's motto, *Nil Admirari*, loudly protesting at first but falling asleep as time wore on.

Winner of the contest was Air Hostess Patricia Wong, of C.A.T., who used the Chinese "belted longies" method to show that this is the fastest way of changing diapers. Miss Dee Volk of P.A.A. and Miss Reiko Kato of J.A.L. were runners-up.

Former Imperial Princess Mrs. Shigeko Higashikuni presents the winner's trophy to Miss Patricia Wong of C.A.T. Flanking her are two runners-up, Miss Dee Volk of P.A.A., left, und Miss Reiko Kato, J.A.L. *On the right:* The Diaper-Changing Derby in full swing.

Farewell pipes and drums.

Aftermath. An American (would you believe it ?) delegate waits for his aircraft at Turnhouse Airport.

The Second European Aeronautical Congress

The Congress delegates at Scheveningen.

The Second European Aeronautical Congress sponsored by the International Association of Aviation Equipment Manufacturers (A.I.C.M.A., *Association Internationale des Constructeurs de Matériel Aéronautique*) was held at The Hague-Scheveningen from September 25th to 29th. Whereas the first Congress was organized last year by the *Association Française des Ingénieurs et Techniciens de l'Aéronautique,* this year's event was prepared by the Association of Aeronautical Engineers in the Netherlands (N.V.v.L., *Nederlandse Vereniging voor Luchtvaarttechniek* and presided over by M. H. C. Van Meerten, President of N.V.v.L.

In the course of five days nearly 400 delegates from Austria, Belgium, Britain, Finland, France, Germany, Italy, Norway, Spain, Sweden, Switzerland and the U.S.A., as well as from the Netherlands, listened to just under 100 lectures. Space restrictions prohibit a listing of the various papers and their authors.

Discussing a subject of more immediate practical interest, General I. A. Aler, President and Managing Director of K.L.M.—Royal Dutch Airlines, addressed his audience of aviation experts on "Turbojet Transport in Civil Aviation". With characteristic frankness, Aler told aircraft designers and manufacturers a few home truths which in the long run can only help to make air transport safer and reliable.

"What are the chances", he asked, "that the fleet of over 200 big and 100 medium jets which have so far been ordered can be put into use successfully from an economic, technical and operational standpoint?... Together with more than 500 propeller-turbine transports and 550 piston-engined aircraft (now on order), they will increase the production capacity of the world's commercial air fleet in 1961 to about 110 percent beyond that of 1955... There is a tremendous sales job ahead. Many markets are still being created for air travel, (but) this does not imply that the market potential can be tapped as easily as in the past...

"In the past, with the introduction of a new type of aircraft, there has always been a tendency to lower costs per capacity ton-mile. The new aircraft coming off the line in the last few years, however, are definitely more expensive to operate than the older aircraft in the fleet. The reasons why these costs are rising is the higher depreciation charges resulting from higher purchase prices. Purchase prices are going up and have offset the improvements secured through technical development.

"The narrow profit margin of the airline is thus becoming smaller and smaller, and unless this trend can be reversed, *there is a feeling that air fares will have to be raised in the future...*

"Now if I have to face the question, '*Are you satisfied with the 1960 jet equipment?*', my honest answer would be in the negative. With all due respect for the high technical achievement that we expect, it is nonetheless *no.*

"In the wake of military development, the air transport industry is still confronted with civil aeroplanes that have no specific civil pedigree. We have to be grateful for the pioneering work that the air forces have performed for the development of our civil equipment, but it is not the final solution. The airline operators have failed so far to indicate clearly their requirements for future operations, though the aircraft manufacturers are asking emphatically for that guidance. The result is that we all buy what is offered...

"*What world transport needs most is an aeroplane with better lift-drag ratio which at a speed of 500 knots can be operated at half the fares of today...* How you gentlemen aeronautical constructors are going to solve that problem—by boundary layer control or electro-gravitics—is outside my sphere..."

Delegates to the Congress watched in-flight demonstrations by the Sud-Est S.E. 210 *Caravelle* jet liner and the Fokker F.27 *Friendship* turboprop transport. Picture shows K.L.M.'s General I.A. Aler (right), Sud-Est Aviation's President Georges Héreil (centre) and Col. Luis Calderon of Linea Aeropostal Venezolana, in front of the *Caravelle*.

On the subject of reliability the K.L.M. President had a number of scathing comments to make. "Engineers assure me", he said, "that the jet is going to be simpler and more reliable than today's piston-engined aircraft. This I do not take for granted yet, because what I see at present is not encouraging. The study of figures of delays and the spectacle of stranded aircraft on nearly every airport does not give me any reason to be satisfied. Apparently a race is going on between aircraft and engine constructors for ever higher performances. However, these performances are obtained at the cost of technical delays and excessive maintenance... (Piston) engines are sold with an approved lifetime between overhauls of 1000 to 1400 hours, but only half of the engines reach this figure. The other half need to be withdrawn prematurely due to basic trouble...

"Aircraft structures and installations keep on giving trouble, and there is no end to the stream of service bulletins incorporating major modifications. So what is left of guaranteed delivery dates and empty weights? We expect to maintain the aircraft's performance over a longer period than just the delivery flight...

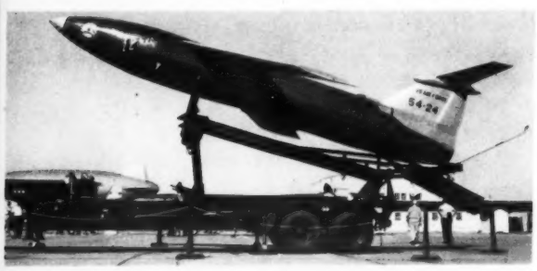
"This may sound a radical statement, but I think that is essentially true: *the airlines are doing part of the designer's and manufacturer's job.* This trend should be reversed in the future. *Airlines... are not equipped and not prepared to do a sort of testing job.* In the jet era, delays and other technical difficulties will be even more troublesome for a number of reasons... I hate to think about the problem of accommodating the people involved when, for instance, two 120-passenger jets have a simultaneous technical delay. Then we may also have to include in our contracts with aircraft manufacturers a guarantee for hotel space along the routes..."

Concurrently with the Congress, A.I.C.M.A. held its Annual General Meeting under the presidency of P.A. Van de Velde, of Aviolanda. After spirited discussions, the gist of which sometimes came to the ears of the Congress delegates despite closed doors, A.I.C.M.A. decided to continue its studies of a European supersonic wind tunnel installation.

OKLAHOMA!

Boeing B-47 *Stratojets* flying over Will Rogers Airport, Oklahoma City. On ground: Fairchild C-119, Douglas B-66 *Destroyer*, Boeing B-47, tail of Beeing KC-97 tanker.

Northrop SM-62 *Snark* long-range guided missile of the U.S.A.F.



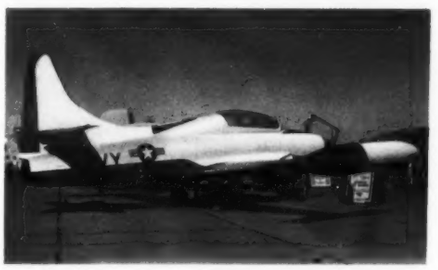
U.S.A.F. Martin TM-61C *Matador* tactical missile.

Martin B-57E (Canberra) target tug. Note target chutes on aft fuselage.

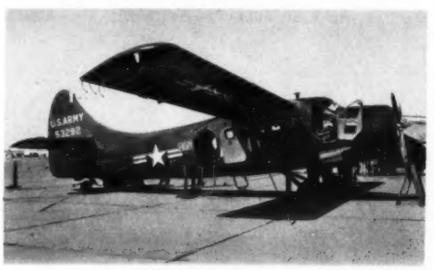
No, not the musical. This year's American National Air Show took place from September 1st to 3rd at Will Rogers Airport, Oklahoma City. Frequently the Show has been likened to Britain's Society of British Aircraft Constructors' display; this comparison seems hardly accurate because Farnborough is primarily a sales exhibition, whereas the National Air Show obviously is designed to show the U.S. citizen what he is getting for his tax dollar. Accordingly, the Show is nearly 100 per cent military, with only a small but excellent static display by engine and equipment makers, and moves to another location every year in order to convince the largest possible segment of the American people of the quality of its military air arms.

With one or two minor exceptions civil aircraft were thus absent from the Show. But the event was spiced by the intensive rivalry between the armed Services, most openly expressed by the spectacular demonstrations of Air Force and Navy-Marine Corps formation acrobatic flying as well as the presentation in flight of the (nearly) latest equipment acquired by the U.S. Air Force, Navy, Marine Corps and even the growing Army Aviation.

A leftover from the old National Air Races are the various Trophy speed dashes which are still organized every year. Much of the pre-war sporting spirit has evidently gone out of these events, since today each race is run by military pilots flying the same type of aircraft. The Bendix Trophy Race was won by a North American F-100 C *Super Sabre,* the Thompson Trophy by a

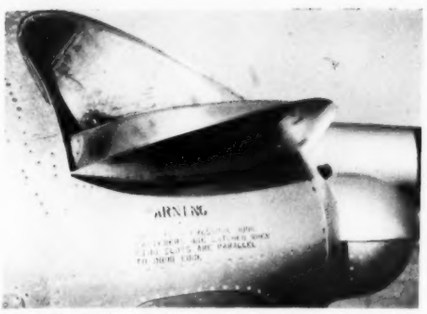


Navy Lockheed T2V-1 *Seafire* advanced trainer.

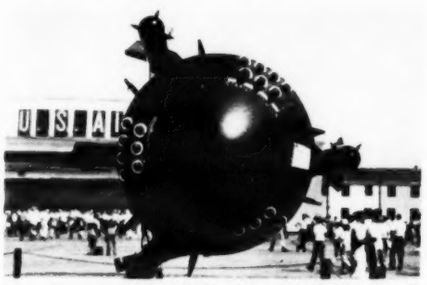


U. S. Army de Havilland (Canada) U-1A *Otter* utility transport.

Army Cessna 4H-41 helicopter.



U.S.A.F. Boeing B-47 *Stratojet* bomber's in-flight refuelling receptacle ("flying-boom" system).



Wing tip pod of U.S.A.F. Northrop F-89H *Scorpion* all-weather interceptor with 21 anti-aircraft rockets and three Hughes *Falcon* air-to-air guided missiles.

U.S.A.F. Douglas B-66 *Destroyer* bomber, aft gun position (without guns), dive brake extended.

Record breaker – the Navy's Chance-Vought F8U-1 *Crusader* carrier-borne interceptor, which reached 1,015 m.p.h. – without trying too hard.

Navy's B-66 equivalent, the Douglas A3D-1, complete with guns, folding tail and wings.

Douglas A3D-1 of the Naval Air Special Weapons Force, of Albuquerque, New Mexico.

Chance-Vought F8U-1 *Crusader* which established a new "national speed record" of 1,015 m.p.h. (although the aircraft is reputed to be capable of much higher speeds), the General Electric Trophy went to a Boeing B-47 E *Stratojet*. Douglas, McDonnell and North American instituted new trophies this year for the winners of groups of Douglas, McDonnell and North American aircraft racing over specially selected courses.

A total of 250,000 spectators are estimated to have attended this year's Air Show, watching the acrobatics, fly-pasts, demonstrations of parachute dropping, air-to-air refuelling, simulated interceptions and bombing attacks, helicopter evacuations etc. On these two pages are a few photographs of some of the equipment on show at Oklahoma City. Of interest may be the fact that the Lockheed F-104 *Starfighter* was not exhibited on the ground but flew over Will Rogers Airport from an adjoining military air base.

U.S. Army Sikorsky H-34A helicopter transporting an "unserviceable" Cessna L-19B liaison aircraft.

Navy's McDonnell F3H-2M *Demon* carrier-borne interceptor equipped with Sperry AAM-N2 *Sparrow* air-to-air missiles.

Navy Grumman F9F-8T *Cougar* transonic fighter trainer.

Air Force heavyweights. Left, front to back: Convair C-131A evacuation aircraft, Convair B-36 bomber, Douglas C-124 *Globemaster* transport; right: Lockheed C-130 *Hercules* turboprop transport; Convair C-99 transport.

They Beat Us

By 150 Million Years

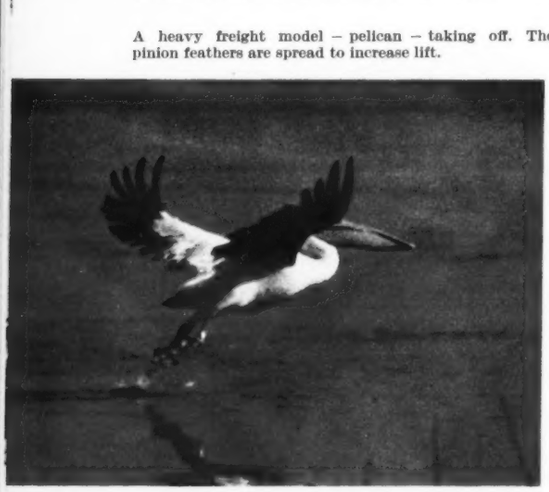
Crowned cranes migrating. (The photographs on these two pages were taken in the Belgian Congo, the Chad Territory and the Camargue, France, by J.-F. Ormond, a Geneva amateur bird photographer.)

By Norman S. Currey, Maple, Ontario

The night heron soaring.

Sea swallow over Lake Edouard in the Belgian Congo.

A heavy freight model – pelican – taking off. The pinion feathers are spread to increase lift.



There seems to be a sort of swelled-headed attitude amongst us Twentieth Century humans that "anything nature can do we can do better". We can travel over land faster than any animal; we can, with our submarines and skin-diving equipment, swim like fishes, faster and deeper than many of them. Our jet planes can fly twenty times as fast as the fastest bird, a great deal higher and farther. Mother Nature can, however, still teach us a few things.

Preceding the first flight by the Wright Brothers on December 17th, 1903, by about 150 million years was the flight of the first bird, the archaeopteryx, and from all accounts it didn't do a great deal better than the Wright Brothers. To quote that eminent expert on bird life, Professor M. Reichel: "Its flight seems to have followed a wavy line and must have been interrupted by prolonged glides. But in no case could the archaeopteryx have been called a high performance soarer—for that purpose he would have had to be of entirely different design."

Then came the Great Pterodactyls of the Mesozoic Period. They were huge, horny-winged birds with long beaks und teeth. Statistics at the Smithsonian Institute in Washington tell us that they had wing spreads of about 20 feet, and weighed from 25 to 30 pounds. The pterodactyls were all killed off by some severe climatic change on earth, and as far as we can tell, all this had been going on before man even came into being.

The birds most commonly observed by the early students of flying were the kite, the stork, the gannet, the seagull, the buzzard, and the albatross. In other words, they were soaring birds, birds which required little power for forward motion.

It was a kite, for instance, that started Leonardo da Vinci thinking about the possibilities of flight. The Lilienthal Brothers used the stork for their research.

The albatross, for those who are fortunate enough to watch it, is one of the finest examples of nature's aerodynamic perfection. There are very few airplanes flying today which have such clean lines. It can, in fact, remain aloft for hundreds of miles without landing. It does flap its wings on take-off, and also very occasionally when it requires extra boost.

One of the albatross's companions in the South Seas is the petrel, a bird also notable for its terrific range. It does, however, remain aloft for long periods not by soaring, but by sheer muscle power. It takes off almost vertically, and flaps its wings for miles without once coming down for nourishment or rest.

The soaring of the albatross, using air currents to give him successive lifting movements and forward glides, is known as "dynamic soaring". The other extreme is "static soaring", that employed by the gannet, and often by the seagull. They merely use the upward air currents as a cushion. They virtually rest on the air, head into wind, and gently float up and down like a cork in a bathtub.

The Neanderthal Man made his appearance some sixty thousand years ago, and both the Bible and the scientists agree that there were birds here long before that. Ever since man appeared on earth he seems to have been studying the flying techniques employed by birds, and from these studies he evolved his ideas on how he too could fly. In nine cases out of ten he completely misinterpreted the actions of the bird.

The Ancient Greeks are often considered to have been the most intelligent race of their time. The advances they made may seem quite elementary to the know-alls of the Twentieth Century. But try to visualize some poor berobed Greek idly sitting on the slopes of the Acropolis. He has never been to school, knows little of mathematics or science, and has no binoculars or similar devices with which to aid his studies. All the same, a Roman by the name of Pliny recognized the functions of a bird's tail as an elevator, and Herodotus figured out that a bird must take off into wind. These two findings, hundreds of years old, were two of the very few correct conclusions on the flight of birds for many a year.

It is not surprising then that man, in making his first attempts to fly, emulated the birds. We have the Greek legend of Daedalus and his son Icarus. Daedalus used his home-made wings to escape from Crete to Italy, but his son was not so fortunate—being an early spaceman he flew too near the sun. This melted the wax holding the feathers together, and he fell into what is now known as the Icarian Sea.

There are many other such legends, and although they are, in the main, figments of the imagination, they do serve to show the trend of thought.

The early scientists and adventurers carried on with their ideas on flying by means of some wing-pumping bird-like machine. But the birds had a great deal up their sleeve that completely fooled all these would-be aeronauts. They had dihedral for sidewards stability, angle of incidence for take off and landing, warping wings for turning, a correct center of gravity position, and a wing area suited to their power and weight. Most of these have only been revealed to us in the last fifty years, in many cases after we had already found that they were necessary on our own flying machines.

Even that great man of the fifteenth and early sixteenth century, Leonardo da Vinci, was completely hoodwinked by the birds. Like the others he concluded that a glider with flapping wings, an ornithopter, was the answer to man's dream of flight. He carefully watched the birds and from his observations he made a scientific analysis of their movements. He wrote books on the subject, which in their day were as profound as a treatise on interplenatary flight would have been in the year 1900.

Not only did he concern himself with the movements of bird's wings, he also examined them from an anatomical standpoint—comparing the skeletons of birds with those of human beings, and noting the similarities. He recognized the shoulder, upper arm, forearm, elbow, and hands of a bird. But even his genius couldn't get away from the idea of emulating the birds, and flying by muscle-power.

It was not until the late eighteenth century that more constructive studies of birds were carried out. Sir George Cayley, a Yorkshireman, who later became known as the "Father of Aeronautics", for the first time published a really classical aeronautical definition when he stated that for mechanical flight we had "to make a surface support a given weight by the application of power to the resistance of the air".

Cayley also was the first man to consider and make proposals for an engine to power a flying machine. He made numerous calculations and observations on bird flight and prepared drawings showing a diagram of forces acting upon a bird's wing, and for the first time we see reference to "lift", "drag", and "parasite drag". He discussed at great lengths how the air flows round a wing, and points out the advantages of a concave wing (later used by the Wright Brothers).

Another hundred years passed before there were any more worthwhile aeronautical advances as a result of bird study. It was in 1890 when Otto Lilienthal constructed his first glider. Otto and his brother Gustav made extensive scientific studies of wing curvature and in the course of these studies made over 2,000 glider flights. In 1889 Otto Lilienthal wrote a book entitled "The Flight of Birds as the Basis for the Art of Flying." The stork seems to have been the Brother's particular medium of research, a study which lasted twenty-five years. The Lilienthals had a machine rigged up to rotate wings at various speeds, and on this machine they tested a whole range of different wing shapes, carefully tabulating the data. Not only did they finally come up with what they considered an optimum wing shape, but also had figures on such diverse facets as center of pressure movement, and wing stability.

Seven years after Lilienthal's death the Wright Brothers were flying at Kittyhawk with an internal combustion engine to help them on their way. Man was so elated that he had at last found the answer to his dreams that it would seem that he forgot all about the birds for a while. Our feathered friends still had a great deal to tell us, but apparently we were not in a receptive mood.

Our 'planes flew with fixed, ugly-looking undercarriages for thirty years, with a consequent penalty in speed, despite the fact that for millions of years birds have been flying with their undercarriages tucked up under their keels or trailing behind them.

Also, what about the direction finding and navigational system used by the birds? The Golden Plover, for example, can make a 2,400 mile non-stop flight every six months or so. Birds had radar when Sir Robert Watson-Watt's ancestors were swinging in the trees. We have also many lessons still to learn in control. The nighthawk, for instance, will plummet vertically downwards from a great height, and then within a few feet from the ground he suddenly lowers his flaps, raises his elevators, and almost stops dead.

The Lilienthal brothers made a particular study of stork flight. A black stork from Ruanda-Urundi.

A heron in flight.

The golden plover covers distances of 2,400 miles non-stop.

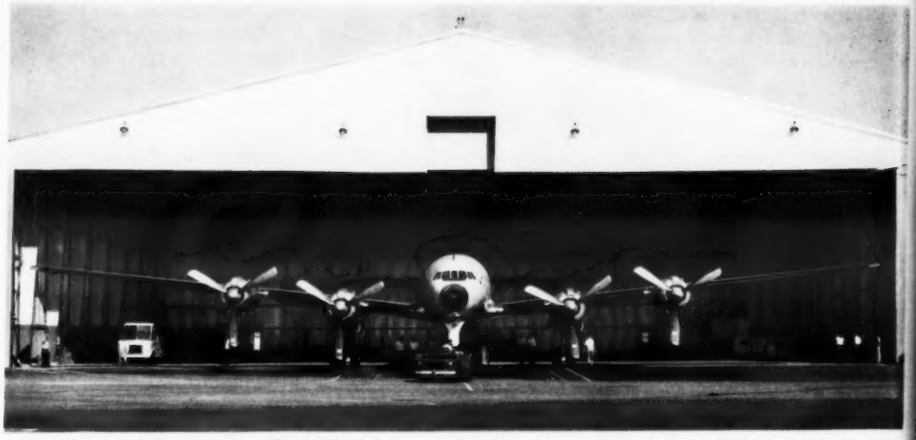
Carrion-kite in Ruanda-Urundi.

The birds, wonderful though they are, do, however, show a remarkable lack of savoir-faire under certain circumstances. Country legend leads us to believe that the birds are good weather forecasters, and yet they sometimes have to make forced landings due to icing conditions or bad weather.

The duck family present an amusing sight as they come in for a landing on a frozen lake, stupidly thinking, no doubt, that they are on water. They flare out and operate their webbed anti-skid brakes, Donald Duck fashion, only to finish up in an ungainly skid, hitting other ducks on the way.

Sometimes, experienced though they are, some of our birds will badly misjudge a landing. The loon for instance, a veteran water bird, may decide to land on too small a lake. He's no good on land, so having braked to a stop he is trapped there until a strong wind comes up. Then off he goes, at full boost, batting his wings like a frightened chicken, making a feverish attempt to clear the end of the runway.

The birds do commit the odd faux-pas, but nevertheless the fact remains that flight today is a direct result of many years of birds study.



Left: This view, taken about 100 feet from the fuselage, illustrates the size of the new wing. The L-1649A is now undergoing a six-month testing and C.A.A. certification programme. First prototype test flight took place on October 10th; production models are scheduled to go into regular airline service in April 1957. — Right: The L-1649A is jockeyed into the weight hangar for corroboration of design weights and balances. Wing span is 150 feet. Note unusual propeller tip shape.

Last of the Piston-Engined Transports?

What will probably be the last major piston-engined commercial transport prototype was rolled out of Lockheed Aircraft Corp.'s assembly plant at Burbank, Calif., at the end of September. Designated the L-1649A *Super Constellation* (see cover), it differs from its sister models by its radically new long-range wing which, with a span of 150 ft., is 27 feet longer than earlier designs, one-sixth thinner and holds 9,600 U.S. gallons of fuel, giving the aircraft a non-stop range of 6,300 miles (without consuming reserves). This will mean that the type will be able to fly non-stop from San Francisco to London, from New York to Rome, from Rio de Janeiro to New York.

Other improvements on the model are spacing the inboard engines five feet farther out on the wing, which permits use of larger, slower-turning propellers for quieter flight and better engine efficiency. The Hamilton Standard hollow-blade steel propellers measure 16 feet 10 inches in diameter, compared with the 15 feet 2 inches of the earlier ones. Some aircraft now on order will have Curtiss-Wright hollow-blade steel propellers.

The L-1649A made its first, successful test flight on October 10th. At present it is undergoing a six-month testing and Government certification programme. Production aircraft are slated to go into regular airline service in April 1957.

Immediately after roll-out the L-1649A prototype went to Lockheed's weight hangar for symmetry check, weighing and balancing to corroborate its original design. Next came a gasoline soak check, in which fuel tanks were filled and emptied and the entire fuel system was exhaustively examined. There followed a test of the new high-pressure hydraulic system (3,000 p.s.i., compared with 1,700 p.s.i. previously available).

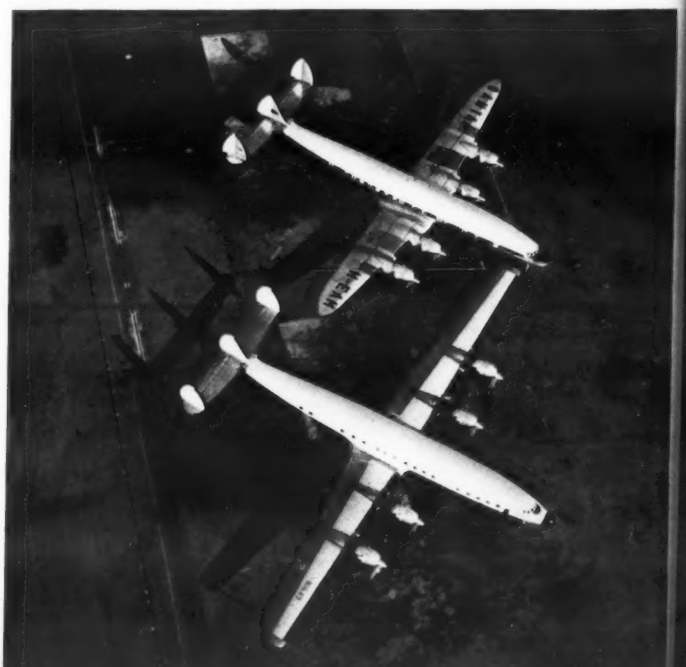
A total of 44 Model 1649A *Super Constellations* are on order for T.W.A., Air France, Deutsche Lufthansa, Linee Aeree Italiane (L.A.I.) and VARIG, of Brazil.

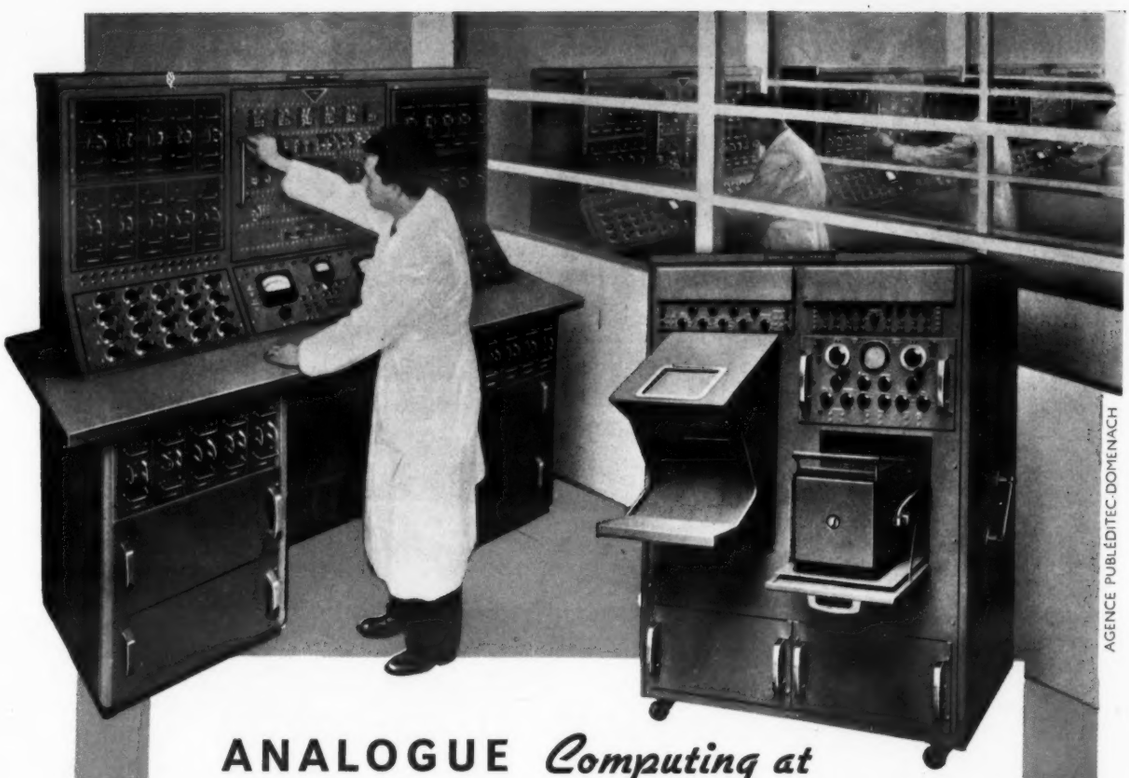
Comparative Figures

	L-1649A Super Constellation	L-1049G Super Constellation
Length	116 feet	116 feet
Span	150 feet	123 feet
Wing area	1,850 sq. feet	1,650 sq. feet
Aspect ratio	12	9.17
Gross take-off weight	156,000 lbs.	137,500 lbs.

The Lockheed L-1649A *Super Constellation* is rolled out of the final assembly hangar. Engines are 3,400 h.p. Curtiss-Wright turbo-compound power plants.

The Old and the New. A comparative study of the new Lockheed L-1649A with an earlier *Super Constellation*.





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ANALOGUE *Computing at* R. DERVEAUX

The **Analogue Computing Centre** at **Laboratoires R. Derveaux,** equipped with "Djinn" computers and a complete set of non-linear, multiplier and function generator elements, undertakes the solution and discussion of physical and mathematical problems represented by systems of linear and non-linear differential equations, integral and integrodifferential equations.

Among the simulation problems recently handled by the Computing Centre are the following:

— Study of automatic control for guided missiles with introduction of real elements into the series.

— Study of aircraft longitudinal and transverse stability, investigation of laws of pilotage on given tracks.

— Propagation of waves on electric lines.

— Simulation of nuclear reactors, with allowance for temperature and Xenon effects.

Mathematical problems:

— Ascertaining the determinants of matrices.

— Solution of Mathieu-Hill differential equations.

— Solution of Fredholm and Volterra integral equations of the first and second kind.

Finally, the Computing Centre is now able to handle flow distribution problems, satisfying Laplace and Poisson bidimensional equations, through combined use of the electric networks method and of "Djinn" computers.

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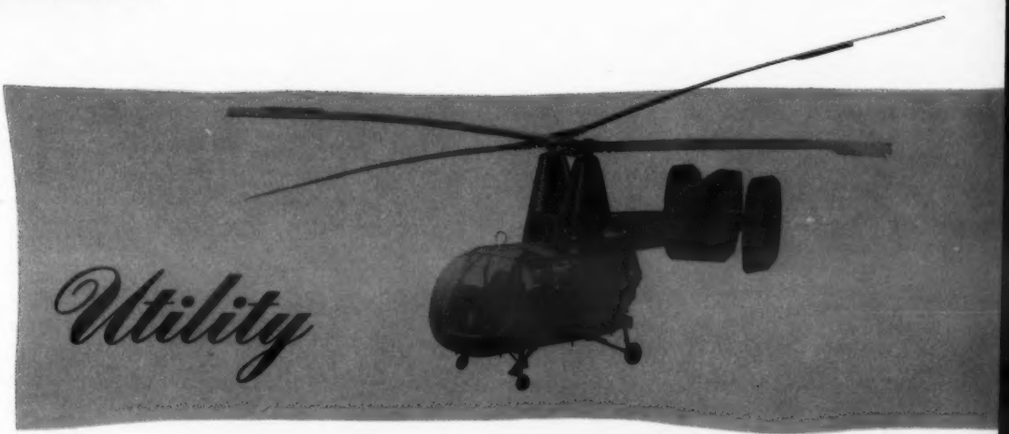

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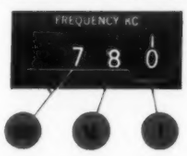
THE NEW ADF

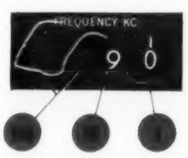
OF COLLINS AIRBORNE ELECTRONICS SYSTEM

RANGE 1000-1800 KC
Rotate 100's knob until first two digits appear in 1000 and 100 kc dials. Next rotate 10's knob for third digit and units knob for fourth digit.

RANGE 100-999 KC
Rotate 100's knob until 1000 kc dial is blank and first digit desired appears on 100 kc dial. Next rotate 10's knob for second digit and units knob for third digit.



RANGE 90-99 KC
Rotate 100's knob counter clockwise to mask 100 kc and 10 kc dials. The latter mask is marked with the "9." Next rotate units knob until frequency appears on units dial. When units dial is rotated above nine, a plus sign appears in window, when rotated below zero, a minus sign.



Receiver Weight: 15.9 pounds
Total Tubes: 11
Receiver Space: ½ ATR
Antenna: Ferrite loop, 6 pounds

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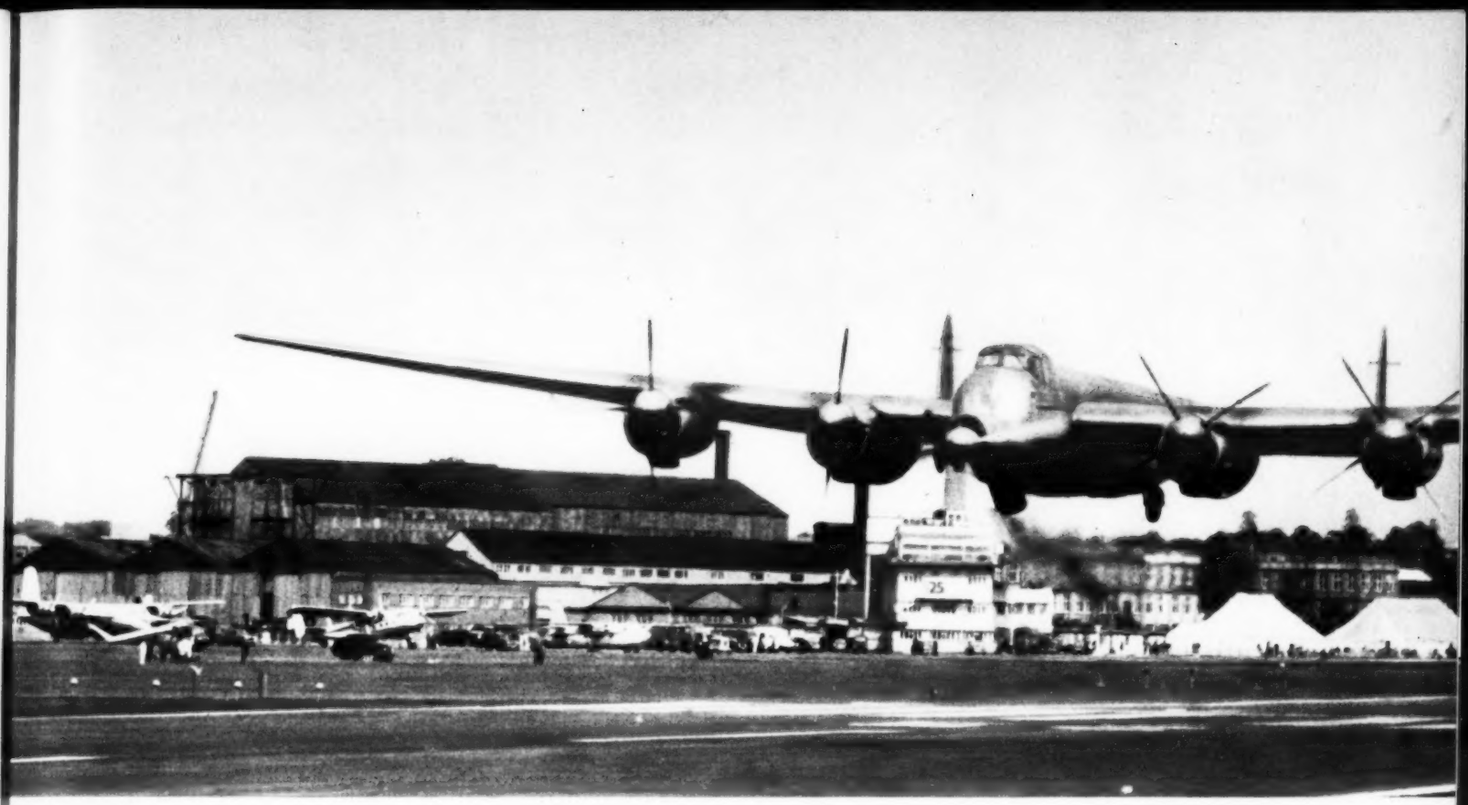


The Avro *Lincoln* with a Rolls-Royce *Tyne* turboprop engine in the nose – the other four engines inoperative.

The 17th S.B.A.C. Flying Display and Exhibition

Farnborough, September 3rd to 9th, 1956

"Undoubtedly", said London's *Punch* in a caption of a cartoon appearing in its special Farnborough issue, "the surprise of this year's Show is Wing Commander-Fitzhugh's wife with Emily Wendover's husband..." *Punch,* we feel, was being unkind. Several things were new at Farnborough this year. First of all, there was the weather which—while it has been none too good during more than one Farnborough week in recent years—was quite unusually filthy in the first few days of September. In addition, although the British aircraft industry did not exhibit any sensationally new aircraft and even withdrew the English Electric P.1 supersonic fighter because of cockpit canopy trouble, the ever-growing Exhibition tent was crammed with new equipment.

An estimated 5,000 to 6,000 officially invited visitors from all over the world came to the Hampshire airfield—proof that in spite of the anticipated absence of radically new airframes the foreign experts considered their trips to Farnborough worth while. As noted elsewhere in this issue, the Americans organize their National Air Show in order to convince their dollar-conscious citizens that their tax money is not being wasted, whereas the S.B.A.C. Display is gradually discarding even the last vestiges of the old "fun fair" atmosphere of barnstorming days: the official programme calmly sets out that its purpose is to "promote the export trade of S.B.A.C.'s member companies."

In the last two or three years even British industrial sources have suggested with increasing frequency that the Farnborough Display be held every two years only, alternating with the Paris International Aviation Salon. It seems, however, that in view of the 1956 record attendance the Society has again discarded the idea; rumours current at Farnborough stated that the many accessory and equipment firms insist on an annual event because so far they have found the display profitable.

The first impression gained by an unbiased observer entering the exhibition tent no doubt was the profusion of aircraft engines on the stands. In fact, there were so many engines that one was tempted to ask where all the airframes to be powered by them were to come from. There were giant jets of up to about 20,000 lbs. static thrust, medium-power and small jets, large, medium and small propeller turbines (one of the biggest, the Bristol BE.25 *Orion,* was not even on show although it was demonstrated in a flying test bed), rocket motors for take-off assistance, gas generators and turboprops for helicopters and convertible helicopters, ramjets and missile rocket motors. In the absence—at least in the immediate future—of a sufficient number of British aircraft models capable of taking these engines, the British power plant manufacturers are making a strenuous effort to sell their products for installation in American airframes (Rolls-Royce *Conway* and Bristol *Olympus* for Douglas DC-8 and Boeing 707, Napier *Eland* for a rumoured Convair 540, *Eland* and Rolls-Royce *Tyne* for the Lockheed *Electra,* etc.).

Numerous novelties and improvements were exhibited also in the fields of electronics and aircraft equipment, as illustrated in these pages.

Two of the main attractions, in the opinion of numerous observers, of the weather-hampered flying display were the Fairey FD.2 delta-wing world speed record experimental aircraft (and its sister aircraft) and the incredibly manœuvrable Bristol *Orpheus*-powered Folland *Gnat* lightweight fighter. Both types, incidentally, suffered from brake parachute trouble during their demonstrations. The Fairey Delta performed a "parachute-assisted take-off" when the chute inadvertently popped out

English Electric *Canberra* with Napier *Scorpion* take-off rocket under the fuselage.

Blackburn *Beverley* demonstrated loading and unloading of 100 troops.

as the aircraft was speeding down the runway; record pilot Peter Twiss cut in the afterburner and climbed away, parachute and all. The *Gnat's* parachute filled with water from the soaking runway after the aircraft had landed, and the aircraft was slewed off the runway onto soggy grass, without damage to machine or pilot.

One feature of the Show which aroused much interest was the presence of a Soviet Air Force mission and a Soviet industrial mission. Replying to questions during press interviews the Russian experts, who visited Farnborough and several Ministry of Supply and Royal Air Force establishments in return for the British missions' visits to Moscow last June, politely and very carefully acknowledged the quality of British flying equipment but missed few opportunities of pointing out that Russian aircraft could do at least as well as those demonstrated at Farnborough. Soviet Minister of Aircraft Production Piotr Vasilievich Dementiev remarked that the Russians were not interested in speed records but Soviet aircraft frequently had flown faster than the Fairey Delta. Lieutenant-General Alexei Blagoveshchensky, chief of a Soviet flying training command, said after flying the *Hunter T.7* trainer that the aircraft might be faster if it had "a more powerful engine". The Minister of Aircraft Production, in response to another question, smilingly pointed out that his party had come to London in a Russian-designed jet-propelled transport (Tu-104) and was not, for the moment, interested in buying British jets!

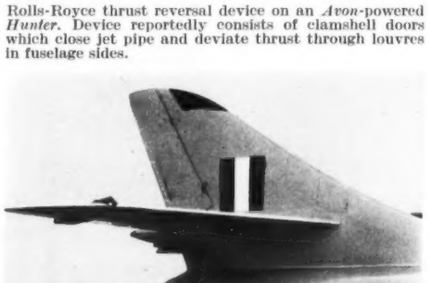
Summing up, it can be said that in spite of certain troubles the British aircraft industry is experiencing with some of its aircraft, in spite of the apprehensions it may have about budget retrenchments and contract cuts, the expression "See you next year!" is still very much justified. Particularly also in view of the fact that, according to scuttlebutt, Farnborough 1957 will produce several surprises not only in the form of Emily Wendover's husband but in that of several brand new aircraft types. Not to speak of power plants and equipment.

Rolls-Royce thrust reversal in action. A smoke bottle was used to make the efflux visible.

Bristol *Britannia 101* test bed with a Bristol *Orion* in the outboard port nacelle, a *Proteus 755* in the outboard starboard nacelle, *Proteus 705's* in the inboard positions.

Bristol 173 transport helicopter – note new tailplane and vertical surfaces.

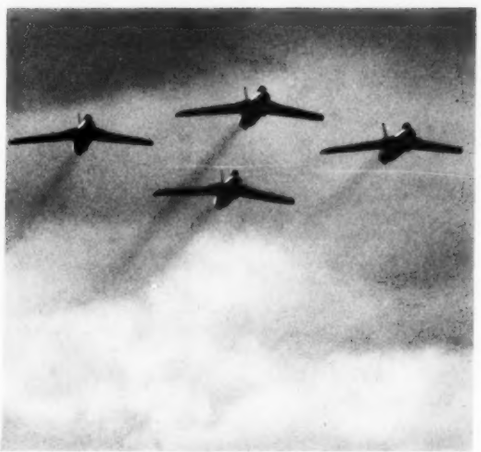
The Short *Sperrin* flying test bed had a D.H. *Gyron* jet (about 19,000 lbs. s. t. each) in the lower half of each nacelle.



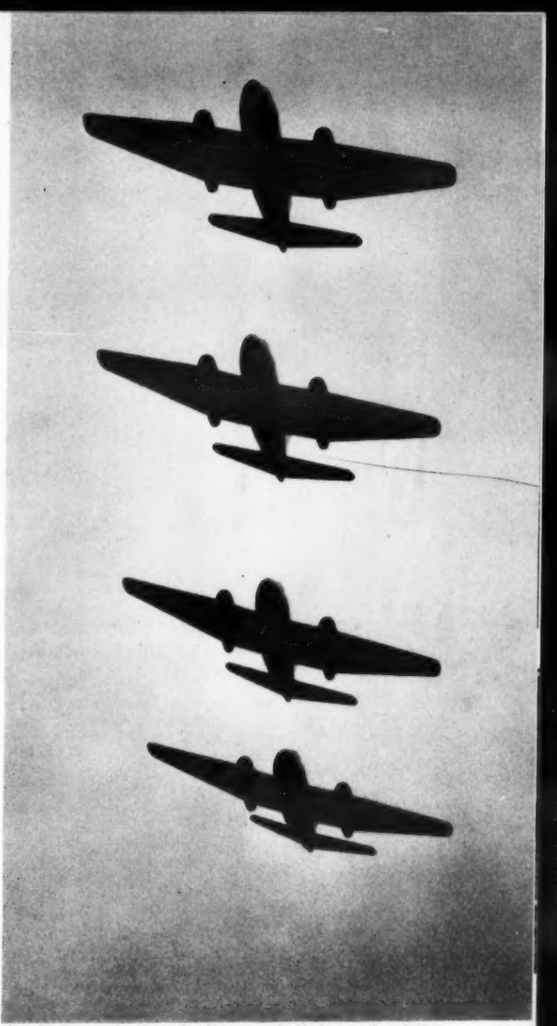
Rolls-Royce thrust reversal device on an *Avon*-powered *Hunter*. Device reportedly consists of clamshell doors which close jet pipe and deviate thrust through louvres in fuselage sides.

Bristol 171 *Sycamore* helicopter.

Crazy duet: Westland *Whirlwind* and *Widgeon*.

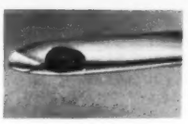


R.A.F. demonstration: *Hunter* aerobatic team.



R.A.F. demonstration: *Canberra* aerobatic team, showing off the aircraft's manœuvrability.

Above: Saro *Skeeter 5* with Napier rocket booster.



Left: Saro *Skeeter 5* with Napier N.R.E. 19 auxiliary rocket motors: propellant tank (hydrogen peroxide) above rotor head, thrust nozzles in blade tips.

The Flying Display

Aircraft are listed in the order in which they were originally scheduled to appear

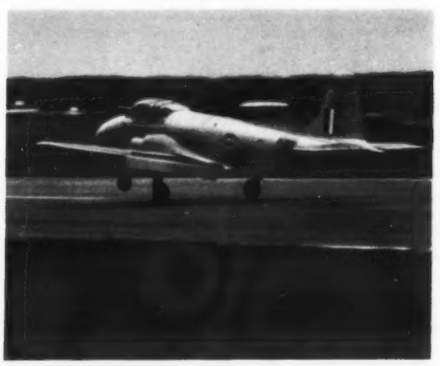
Blackburn *Beverley C. 1*
De Havilland Engine *Gyron Sperrin* test bed
Bristol *Orion Britannia* test bed
Napier *Scorpion Canberra* test bed
Rolls-Royce *Tyne Lincoln* test bed
Rolls-Royce R. A. 29 *Canberra* test bed
Hawker *Hunter* (reverse thrust)
Display by aircraft of the Royal Air Force (Hawker *Hunters*, English Electric *Canberras*)
Bristol *Sycamore* helicopter
Bristol Type 173 helicopter
Saunders-Roe *Skeeter 6* helicopter
Westland *Widgeon* helicopter
Westland *Whirlwind* helicopter
Fairey Ultra-Light helicopter
Auster *Aiglet* trainer
Hunting Percival *Jet Provost* trainer
English Electric *Canberra P. R. 9*
Folland *Gnat* light fighter
Gloster *Javelin T. 3* trainer
Gloster *Javelin F(AW) 7* fighter
Hawker *Hunter F. 4*
Hawker *Hunter T. 7* trainer
Hawker *Hunter F. 6*
De Havilland D. H. 110 naval fighter
Vickers-Armstrongs N. 113 naval fighter
Vickers-Armstrongs *Swift 7* attack aircraft
Fairey F. D. 2 delta (two)
Avro *Vulcan B. 1* bomber
Vickers-Armstrongs *Valiant B. 1* bomber
Handley Page *Victor B. 1* bomber
Bristol *Britannia 301*
Vickers-Armstrongs *Viscount 802*
De Havilland *Heron*
Hunting Percival *Pembroke C. 1*
Scottish Aviation *Pioneer*
Fairey *Gannet A. S. 4*
Hawker *Sea Hawk FGA. 6*
Handley Page *Herald*
Scottish Aviation *Twin Pioneer*
Hunting Percival *President*

Fairey Ultra-Light helicopter with Blackburn-Turboméca *Palouste* engine and blade-tip nozzles.

Auster *Aiglet* trainer.

Saro *Skeeter 6* light helicopter lands on a truck.

Hunting Percival *Jet Provost* trainer.



English Electric *Canberra* P.R.9 altitude reconnaissance bomber with enlarged wing centre section and wing tips.

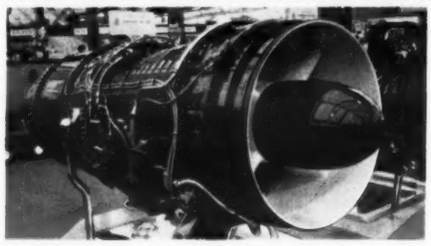
Farnborough

Hawker *Hunter F.6* with Fairey *Fireflash* air-to-air missile.

Power Plants at Farnborough

Alvis Leonides Major 14-cylinder two-row radial of 870 h. p. take-off power, shown here in the version fitted in the Handley Page *Herald* feeder airliner.

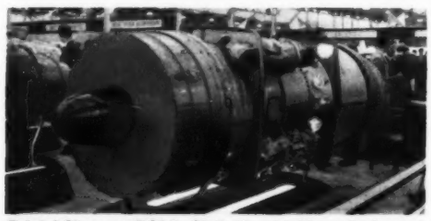
Armstrong Siddeley Viper 102 (ASV. 8)—Powers the Hunting Percival *Jet Provost T. 2;* max. power 1,750 lbs. thrust; specific consumption 1.1 lbs./lb. t/hr.



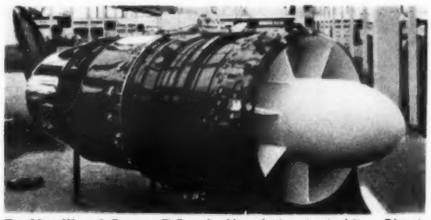
Armstrong Siddeley Sapphire 202 (ASSa. 7)—Max. thrust 11,000 lbs.; specific fuel consumption 0.85 lbs./lb.t/hr. *Sapphire* engines in various versions are fitted in the *Hunter 5*, Gloster *Javelin*, Handley Page *Victor*, etc.

Blackburn-Turboméca Artouste—Turbine power unit for shaft drive, here coupled with a 43 kVA Plessey generator for accessory drive.

Bristol Orpheus—Light-weight turbojet in the 4,000 to 6,000 lbs. thrust class; fitted in the Folland *Gnat*, Aerfer *Ariete*, Fiat G. 91; planned for Breguet *Taon*, Dassault *Etendard VI*, Icarus B. 12, Hispano-Aviación HA. 300 and Fuji F1 T1.



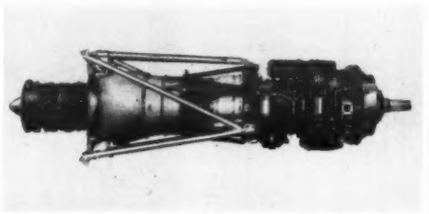
Bristol Olympus BOl.6—Static thrust (without afterburner) 16,000 lbs.; versions of this twin-compressor engine are in production for the Avro *Vulcan*.



De Havilland Gyron DGy. 1—Now being tested in a Short *Sperrin* "flying test bed", this engine is designed for future supersonic fighters. During its acceptance tests it delivered a thrust of 15,000 lbs., but is believed to have reached a substantially higher power since then.

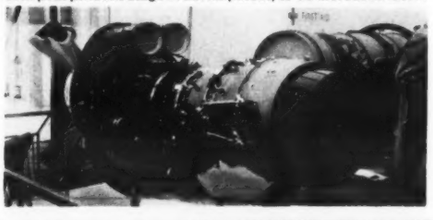
Rolls-Royce RB.109 Tyne—Propeller turbine projected for the Vickers *Vanguard* commercial transport; power 4,695 e. h. p. at present stage of development, to be increased later.

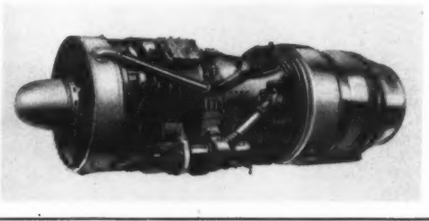
Napier Gazelle—Gas turbine for helicopters, built in the versions NGa. 1 (1,260 s.h.p.), NGa. 2 (1,650 s.h. p.), NGa. 3 (1,800 s.h.p.) and NGa. 4 (2,000 s.h.p.). Projected for Bristol 192 and Westland *Wessex*.



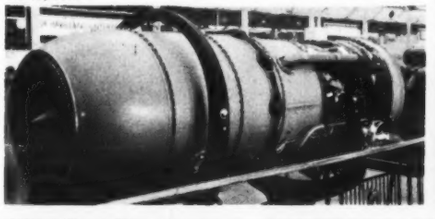
Napier Rotodyne-Eland—Derived from the Napier *Eland* propeller turbine, with additional compressor, for installation in the Fairey *Rotodyne* compound helicopter.

Rolls-Royce Avon RA. 29—Most powerful civil version of the *Avon 200* series, with a thrust of 10,500 lbs.; projected for *Comet 4* and fitted in the *Caravelle*.



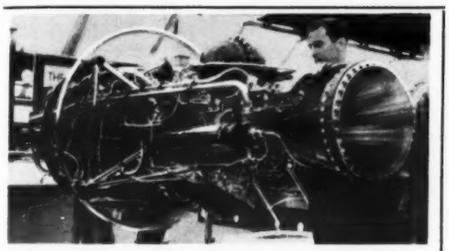


Rolls-Royce Conway—By-pass jet; versions RCo. 5 and RCo. 7 have been type tested at a max. thrust of 13,000 lbs. Installation projected in DC-8 and Boeing 707 commercial transports.

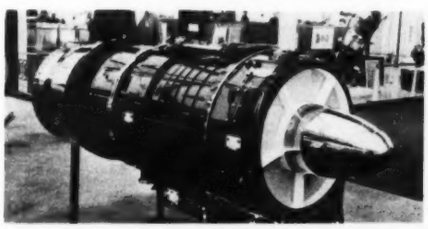


Vickers-Armstrongs N.113 fighter in landing attitude.

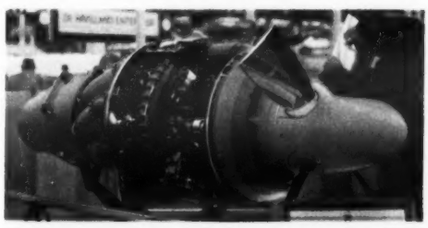
D.H.110 twin-engined naval fighter about to land – flaps and arrester hook down.



Armstrong Siddeley Screamer—Rocket motor shown to the public for the first time; thrust 8,000 lbs., weight 470 lbs.

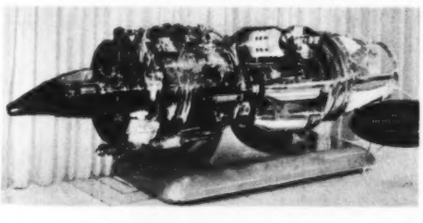


De Havilland Gyron Junior DGJ.1—Derived from the larger *Gyron* and shown for the first time; power class is given (unofficially) as 8,000 to 11,000 lbs.



Rolls-Royce Dart 510—Propeller turbine of 1,780 e. h. p., as fitted in the Vickers *Viscount* and Fokker F. 27 *Friendship* (*Dart 511* version).

Orenda Engines Orenda 14—Powers the Canadair *Sabre 6*; thrust 7,275 lbs. Orenda engines of a later version are fitted in the Canadian Avro CF-100 all-weather fighter.



Droop-snooted Fairey F.D.2 Delta speed record type.

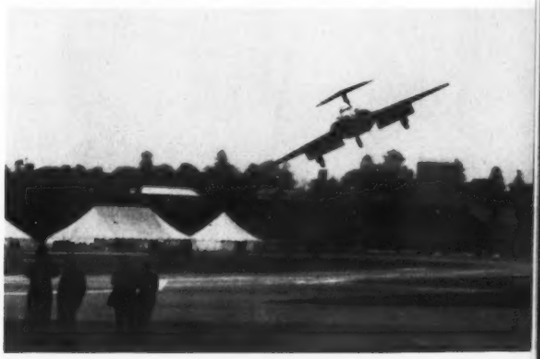
Folland *Gnat* light fighter with 30-mm guns in air intake walls.

Vickers-Armstrongs N.113 twin-jet naval fighter prototype – note new tail configuration, auxiliary tanks.

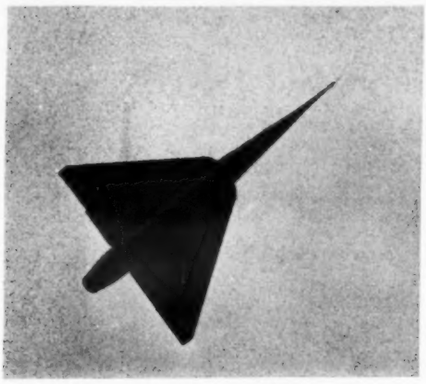
Gloster *Javelin* "flying tail" and jet exhaust fairing.

Gloster *Javelin T.3* trainer.

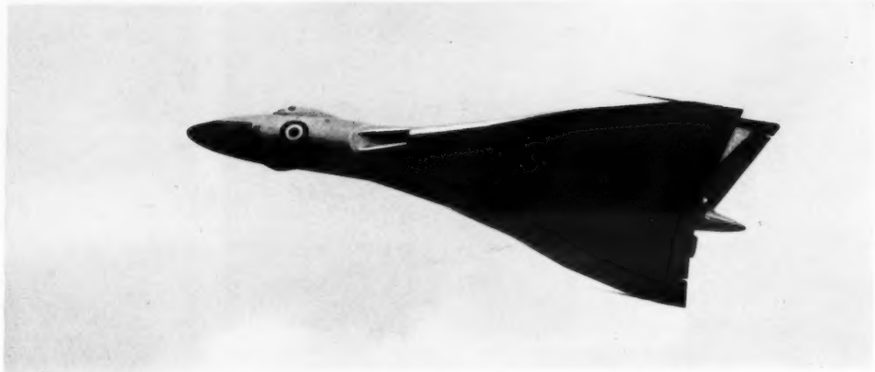
Javelin T.3 about to land.



Farnborough

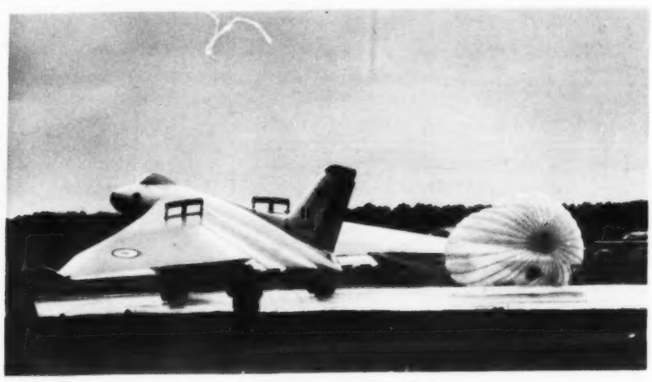


Fairey Delta in flight.



Avro *Vulcan B.1* bomber.

Fairey Delta lands with drooped cockpit.



Avro *Vulcan B.1* landing.

Soviet visitors

At microphone: P. V. Dementiev, Soviet Minister of Aircraft Production; *right:* Rt. Hon. Reginald Maudling, British Minister of Supply; *second from left,* E. C. Bowyer, Director of the Society of British Aircraft Constructors.

Outside the President's tent: *right,* C. F. Uwins, new S.B.A.C. President, Chairman of Bristol Aircraft Ltd.; *at his left* (with spectacles), Dr. A. E. Russell, Director and Chief Engineer, Bristol Aircraft; *facing camera,* Sir Reginald Verdon Smith, Chairman and Joint Managing Director, Bristol Aeroplane Co., Ltd.; *back to camera* (with hat), Soviet Minister of Aircraft Production P. V. Dementiev.

Fairey Delta's afterburner.

Vickers-Armstrongs *Valiant B.1* taking off with assistance from two D. H. *Super Sprite* rockets.

Stores of Fairey *Gannet A.S.4* anti-submarine aircraft.

D.H. *Super Sprite* rocket under the engines of Vickers-Armstrongs *Valiant B.1* four-jet bomber.

First Vickers-Armstrongs *Viscount 802* turboprop transport of B.E.A.

Prototype of Bristol *Britannia 301* long-range turboprop transport.

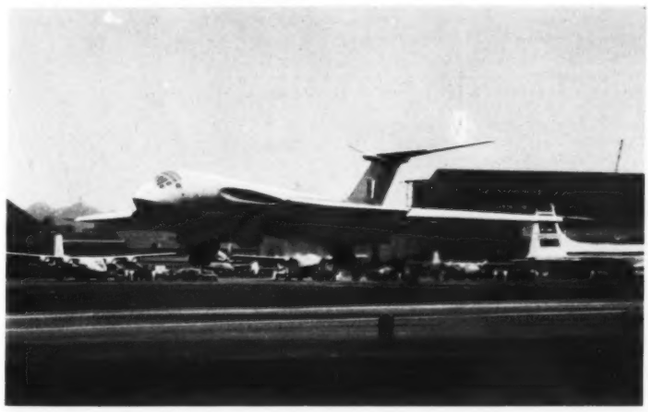
Vickers Supermarine *Swift MK 7* with Fairey *Fireflash* guided missiles.

Fairey *Gannet A.S.4* carrying two tons of mines, rockets, etc.

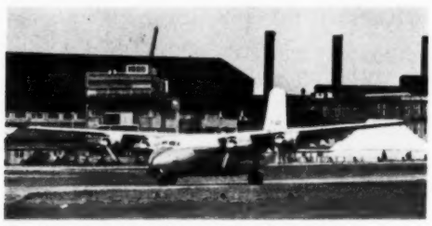
Hawker *Hunter T.7* two-seater trainer.

Hawker *Sea Hawk FGA.6* naval attack fighter with rockets and bombs.

Handley Page *Victor B.1* bomber lands.



Scottish Aviation *Twin Pioneer* light transport shows off its short take-off and landing characteristics.



Handley Page *Herald* branch line transport.

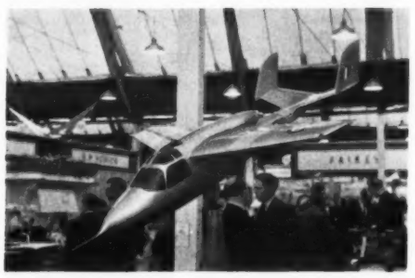
Short *Seamew* anti-submarine aircraft.

The new Hunting Percival *President* executive transport.

Rolls-Royce *Tyne* turboprop in nose of *Lincoln* test bed.

Small-Scale Models

Folland Aircraft Ltd.: Model of the two-seat *Gnat* for training purposes. Compared with the single-seat fighter version, the two-seat trainer has a larger wing span and chord and a longer fuselage. The pilots' seats are arranged in tandem; complete dual controls and duplicate sets of radio equipment. Folland/Saab light-weight ejection seats for both student and instructor.—The *Gnat* two-seater is designed for top speeds equivalent to Mach 0.97 and would have an endurance of 75 minutes without auxiliary tanks. With external tanks under the wings an additional 60 minutes can be flown. A new version of the Bristol *Orpheus* turbojet with slightly reduced power, lower specific consumption and higher running period between overhauls is under development for the two-seat *Gnat*.



F. G. Miles Ltd. showed models of the Miles M. 100 *Student* and the H. D. M. 106 passenger and cargo transport project which is to be equipped with a Hurel-Dubois high-aspect-ratio wing.—The two-seat *Student* trainer, the prototype of which has now reached the testing stage, was built as a private venture and is noteworthy for its low purchase, operating and maintenance costs.—A prototype (designation H. D. M. 105) of the H. D. M. 106, which is to be fitted with two 290 h. p. Lycoming GO-480 engines, is being built and is to begin flight testing before the end of the year. The H.D.M.106 will be able to carry a payload of roughly 3,000 lbs. or 15 passengers.

Bristol Aircraft Ltd.: In addition to models of the *Britannia 310* and the *Sycamore* helicopter, special prominence was given to the Bristol 192 twin-engine helicopter, which is in production for the Royal Air Force. This machine will have three-fold duties, being used for troop and freight transport, ambulance services and search and rescue operations. As a freighter it could carry a max. load of 6,000 lbs. or 18 troops with full equipment (or 25 fully-equipped men over shorter distances). For ambulance duties twelve stretcher cases and three walking wounded, plus an attendant, can be carried. Power plant will be two Alvis *Leonides Major* piston engines of 850 h. p. each; for later versions the Napier *Gazelle* gas turbine (1,300 s. h. p.) is planned.—The Bristol stand also showed a model of a *Britannia* cargo version, which apparently would be powered with Bristol BE. 25 *Orion* turboprops.

Westland Aircraft Ltd. exhibited models of the whole series of helicopters already being built or projected for production by this firm: *Wessex* (for the Royal Navy), *Widgeon*, *Whirlwind* and *Westminster*.—The pictures here show the turbine-powered *Westminster* in a civil version (40 passengers) and a military version. In civil operations it would have a cruising speed of 130 knots and a stage length of about 150 nautical miles.

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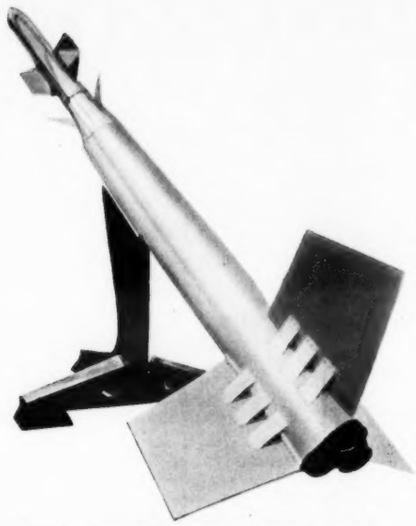
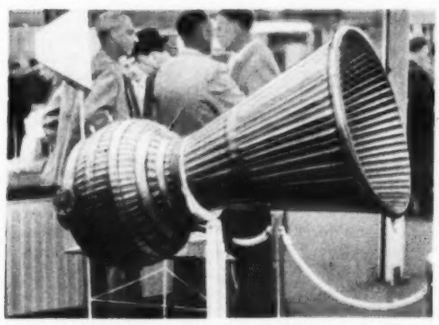
Guided Missiles at Farnborough

The guided missiles shown at this year's S.B.A.C. Display included for the first time a real weapon, the Fairey Fireflash *air-to-air rocket. This supersonic beam-rider consists of a central body with wing and tail vanes but no propulsion unit, and two solid-propellant rocket motors attached by means of explosive bolts. It is said to have been under test for some two years and is now going into squadron service. At any rate, a good dozen were to be seen at Farnborough, most of them mounted on jet fighters. Their field testing equipment and transport trolleys also seem to be operational.—On the other hand Britain's second serious guided missile, the English Electric large calibre anti-aircraft rocket, was shown only in photographs, while the full-size exhibit in the tent (see picture) was merely a training device for rocket operators.—Of interest were also the experimental vehicles for testing control systems (Bristol) or power units (Napier), the large* Raven *solid-propellant rocket motor developed by the Royal Aircraft Establishment, Westcott, and finally the more recent missile engines by Napier and Bristol.*

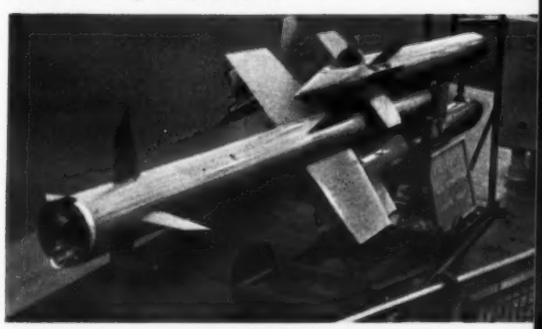


English Electric unpowered surface-to-air training missile (with recovery parachute), with three-burner booster; max. speed 2,000 ft./sec.

The Bristol *Thor* ramjet, which has been tested at Woomera, Australia, is said to be capable of lifting surface-to-air missiles to heights of at least 60,000 ft., using take-off boosters; length 8 ft., intake diameter 9 ins., efflux diameter 15.5 ins.

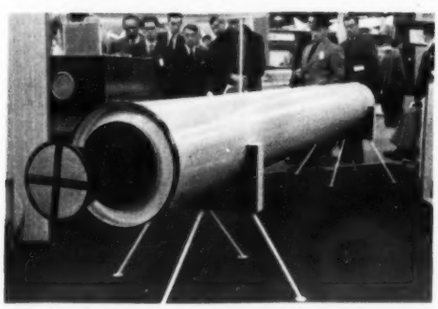


R.A.E. Westcott's large rocket combustion chamber for a thrust of 50,000 lbs. (combustion chamber pressure approx. 500 lbs./sq.in.) burns kerosene (which also serves as coolant) with liquid oxygen. It consists of 32 identical (hollow) stainless steel segments welded together.



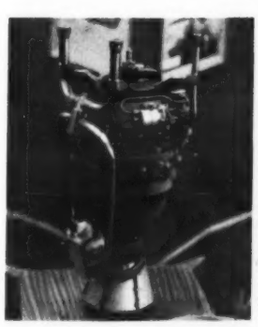
The Fairey *Fireflash* on its handling trolley. Wing span is 2 ft. 4 ins., length 9 ft. 4 ins. including power units; beam receiver and controls of this air-to-air rocket are housed in the unpowered central body.

Bristol's exhibits included this unpowered supersonic test vehicle which is accelerated by a three-burner booster to approx. 2,000 ft./sec. and is used for testing guidance systems. The vehicle is recovered by means of a parachute stowed in the rear.

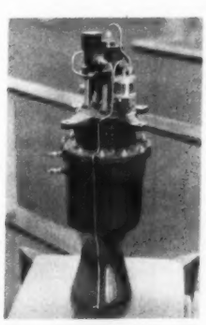


R.A.E. Westcott (in conjunction with Bristol) has developed the *Raven* solid-propellant rocket motor (above) for use in high-altitude research vehicles. Length 16 ft. 10 ins., diameter 17 ins., thrust 11,500 lbs. for 30 seconds.—Below, model of an 80 ft. launching tower being built at Woomera for the *Raven*-powered test vehicle.

Ramjet-powered test vehicle (RJTV. 29) with eight booster rockets, a joint development by D. Napier & Son Ltd. and the National Gas Turbine Establishment. It is being tested in moderate numbers.



The Napier NRE. 11 liquid-bipropellant rocket motor (with combustion chamber cooling) for guided missiles, has been in production for some four years. Capable of regulation to either full or half power, it delivers more than 2,000 lbs. thrust at the former.

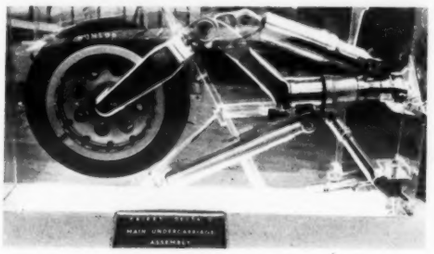


Napier's latest guided missile engine is the NRE. 17, of roughly similar thrust to the NRE. 11. Combustion chamber and nozzle are uncooled, so that the engine is simple to manufacture and can be produced in large numbers.

Farnborough

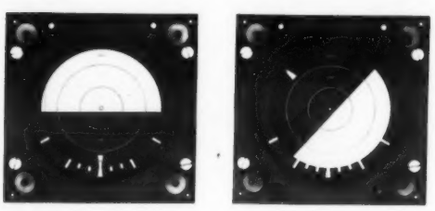
Equipment at Farnborough

● **British Messier Ltd.,** Gloucester: *David and Goliath* —the nose wheel units for the Folland *Gnat* light-weight fighter (right) and for the Bristol *Britannia* commercial transport demonstrate the firm's far-ranging production programme, which also includes hydraulic accessories and rotor controls for helicopters.

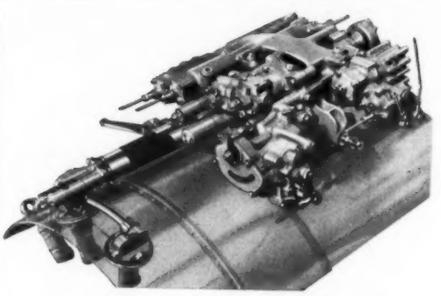


● **Fairey Aviation Co. Ltd.:** This demonstration model shows the ingenious retraction mechanism for the main undercarriage unit in the Fairey Delta 2 experimental aircraft. After turning about several axes the wheels finally come to rest flat in the extremely thin delta wing.

● **Folland Aircraft Ltd.** has developed this twin-spar wing of only 6% thickness/chord ratio for a development of the *Gnat* light-weight fighter. The thick skin sheets between forward spar and ailerons are stiffened by three longitudinal webs and four pairs of stringers with pre-stressed torsion rods, while the thin-walled leading edge has simple longitudinal profiles and stub ribs.



● **Kelvin & Hughes (Aviation) Ltd.,** Barkingside, Essex, exhibited this attitude indicator: the black sector represents the earth, the white sector the sky; attitude angle is indicated by the position of the central circle. When the aircraft axis is tilted sharply upwards or downwards, an aircraft symbol appears in the white or black sector, with the tail pointing towards the horizon. The instrument settings shown indicate (left) a slight climb and (right) transition from a left roll into inverted position.

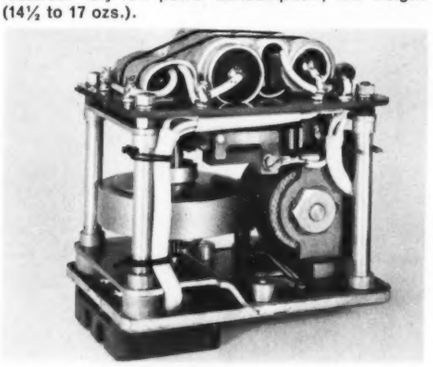


Sperry Gyroscope Company Ltd., Brentford, Middx. has developed the electric gyro horizon type H.L.9 shown here in a scale of roughly 1 : 2. Pitch is indicated by a horizontal bar registering against a fixed "gull-wing" datum (range 360°), with normal pitch indication being provided by the horizon bar up to 10° climb or dive. Beyond this limit the pitch angle is indicated on an auxiliary drum scale. The instrument can be operated from 27-volt D. C. via a transistor oscillator inverter or direct from a 115-volt, 400 cycle A. C. supply. It can therefore be used as either a primary instrument (in aircraft with no A. C. supply) or a stand-by.

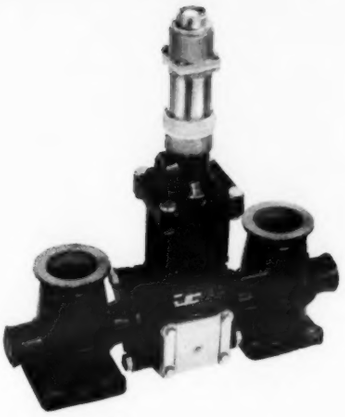
● **Dowty Fuel Systems Ltd.,** Cheltenham, Glos.; Single circuit fuel control system for jet engines with spill burners. The various assemblies of this hydraulically controlled system are collected together in a weight and space saving housing, instead of being scattered round the engine. The hydraulic regulation of rotary speed makes use of a feature of the spill burner, namely that the difference between pressures at the intake aperture and the spill aperture of the burner remains essentially constant for a given speed, regardless of the quantity of fuel injected.

● **P. Frankenstein & Sons (Manchester) Ltd.,** has designed, in conjunction with the R.A.F., R.A.E. and the Ministry of Supply, the pressure jerkin Mark 1 illustrated here. It is worn over an anti-G suit and covers only the upper half of the pilot's body to provide the necessary counter pressure to the lungs when pure oxygen is breathed at altitudes of over 40,000 ft. Without this counter pressure the pilot would be unable, because of inadequate oxygen concentration in the blood, to dive to safer altitudes in the event of pressurization failure.—A gas-inflated flotation cushion and pockets for emergency radio equipment etc. are provided with the jerkin.

● **Plessey Company Ltd.,** Ilford, Essex: Inertia type flasher unit for navigation lights, consisting of a flywheel, kept in uniform oscillation by an electromagnet, and a change-over switch for two external lamp circuits, operated by the flywheel. The latter also contacts in the supply to the magnet, in such a way that the frequency of operation of the change-over switch is constant and independent of voltage variations. Operating voltage 16 to 29 volts D. C. Special features: very low power consumption; low weight (14½ to 17 ozs.).

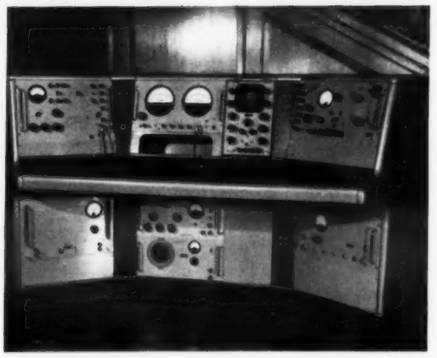


● **Normalair Ltd.,** Yeovil, Somerset: This ultra-light oxygen equipment for sports aircraft and gliders was successfully used by the British participants in this year's World Gliding Championships at St. Yan, France. The complete equipment weighs 8.8 lbs. or 12.7 lbs., depending on the capacity of the oxygen storage cylinder. It contains the following parts: 1 – pressurized container for 400 or 750 litres of oxygen (not shown in picture); 2 – contents gauge and control unit (on the right-hand cabin wall) for flows of 1, 2, 3, 5 or 10 litres per minute; 3 – face mask.

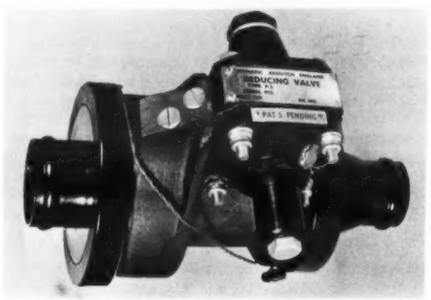


● **Teddington Aircraft Controls Ltd.,** Merthyr Tydfil, South Wales: In addition to butterfly valves of the class of the FMP/A/47 double electro-pneumatic valve for hot air circuits shown here, the firm's production programme also includes a wide range of sleeve valves and pneumatic regulators, pressure switches, "Vernatherm" thermostats for oil temperature regulation and filter de-icing, time switches for navigation lights and de-icing systems, programme switches for starting jet engines, pressure transducers and accelerometers under licence from Giannini & Co. Inc., New York.

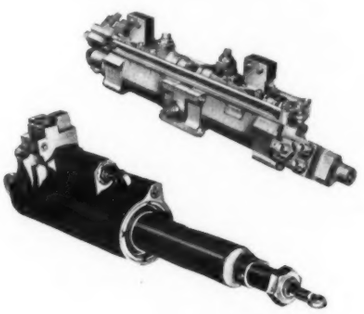
● **Reilly Engineering Ltd.,** Guildford, Surrey: Internal grinding machine with high-speed spindle for speeds of up to 100,000 r.p.m. The spindle is driven by hydraulic fluid via a small turbine and is journalled in an extra-thin oil film, so that the rotor never makes metallic contact with the stationary bearings (play between spindle rotor and housing 5 to 10 microns). A sensitive pressure gauge in the side of the housing indicates the slightest radial or axial thrust applied to the grinding wheel and facilitates operation of the machine.



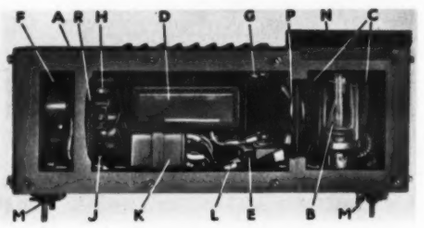
● **Solartron Electronic Group Ltd.,** Thames Ditton, Surrey: Solartron Servo-Test Console for testing all types of servo systems, includes the Transfer Function Analyser, introduced in 1955, to measure the response of electro-mechanical systems, a Mechanical Reference Generator for testing purely mechanical and hydraulic servo systems, a Carrier Converter and a Sub-Sonic Power Amplifier to test systems containing heavy current or solenoidal relays operating valves.



● **Hymatic Engineering Co. Ltd.,** Redditch, Worcs., makers of control and regulating devices of all kinds, included this highly sensitive reducing valve (designation PS. 81) in its exhibits. An extremely accurate sleeve valve, coupled with a servo control, enables outlet pressure to be controlled to within ± 0.1 p. s. i.

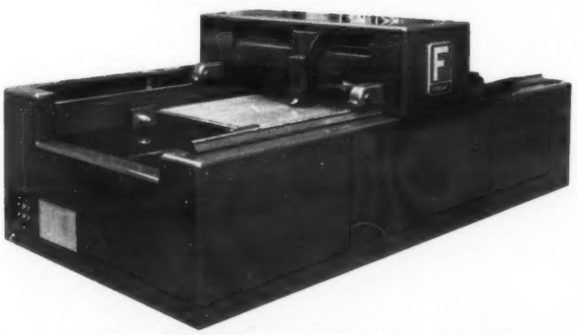


● **Lockheed Hydraulic Brake Co. Ltd.,** Leamington Spa, Warwickshire: In addition to undercarriage parts and general hydraulic equipment, the firm also showed "Servodyne" hydraulically operated power flying controls. Top, a tandem unit for the SE. 210 *Caravelle;* below, an aileron booster for the de Havilland *Comet*.



● **Pyrene Company Ltd.,** Brentford, Middx.: This photo-electric smoke detector (designation P.S.D.A. 1/G. 4) for visual or acoustic fire warning weighs only 2.9 lbs. and, thanks to its small dimensions (11½ × 3¾ × 4¾ ins.), can be installed in points of the aircraft not accessible in flight. A single cable connects the equipment to the warning device in the cockpit. The smoke detector has been approved by the Air Registration Board and can also be used to detect hydraulic oil mist from pipe leakages etc. B – projector lamp; D – detector cell; E – balancer cell; F – sensitive relay; K – power relay; P – projection lens.

Ferranti Ltd., Edinburgh: This electronically controlled template cutting machine uses the Ferranti system of controlling machine tools by means of numerical values. After completion of the works drawing, a planning sheet is prepared, and the data from it are typed on a teleprinter machine which transfers the information to punched paper tape (picture). This tape is then fed into a special digital computer which converts the coded information into continuous control signals for the machine, recorded on magnetic tape. The control unit shown on the right converts the instructions on the magnetic tape into controlled power for the servo motors of the template machine (left). The machine's "head" can be either a pen when drawing is required or a high speed routing head with a small diameter cutter. Dimensions of working table 8 × 4 ft.

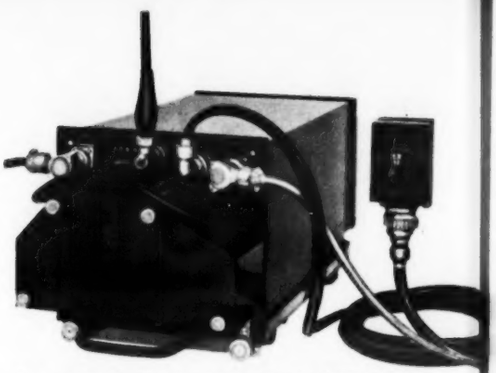


● **Tiltman Langley Ltd.,** Redhill Aerodrome, Surrey, has developed a new system of aluminium soldering. Work is soldered at a temperature of 250°C with a glass fibre tool; no flux is used, in order to reduce corrosion risk to a minimum.

Farnborough

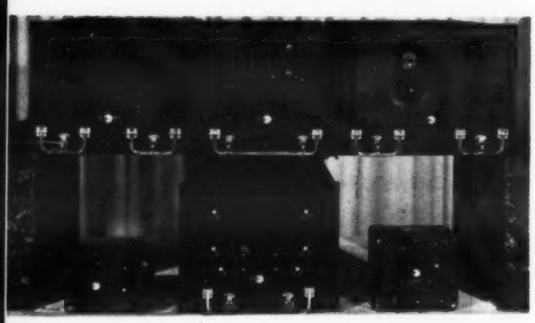
British Airborne Communications Equipment

By J. H. H. Grover, M.I.N., London



For smaller aircraft there is the Standard STR.9Z VHF transmitter/receiver for 44 channels. It is inter-changeable with the same manufacturer's older STR. 9 10-channel equipment.

Although inclined to be somewhat conservative by nature where aircraft communications equipment and practice is concerned it is significant that the British electronics industry is now following the lead set in one direction by the United States. For many years now American thought has tended to favour radio telephony (R/T) as the normal medium for both long and short range air-to-ground communications; in fact, during the last War the U.S. Air Transport Command was using telephony over most of its routes for this purpose. The United Kingdom has been slow to accept R/T for long-range use, preferring to continue in the use of radio telegraphy (CW and MCW). But the number of CW channels has been progressively reduced throughout the world, while from the economy point of view the idea of reducing the complement of the flight crew by dispensing with a radio operator has doubtless played a major part in the growing use of R/T for all purposes.



For large commercial aircraft: the Marconi AD.307 HF transmitter/receiver.

*

Recognising the fact that pilot-operated R/T has come to stay, it is pertinent to consider current British trends and practices in this field. The first moves to be made by the industry were to provide installations that allowed for operation by either the pilot or a radio operator, and allowing for the selection of either CW or R/T facilities. But tuning requirements were kept to a minimum, the transmitters and receivers being pre-tuned to a number of crystal controlled frequencies.

A typical example of one such installation is the Marconi AD. 107B/AD. 114 transmitter and receiver. This equipment is designed for large transport aircraft and may either be directly controlled by a radio operator or else form a completely remotely-controlled facility. The transmitter provides for operation on either R/T or CW on 20 crystal controlled channels, while the receiver provides similar services on 30 channels; for pilot operation the entire installation may be controlled by means of a simple remote control in the cockpit. The frequency range of the AD. 107B/AD. 114 is 2—18.5 Mc/s, at a power output of 40 watts unmodulated carrier on R/T and 160 watts on CW. The complete installation, less cables, for pilot operation weighs about 128 lb.

The latest step towards the all-R/T communications structure is exemplified in *Standard's STR. 18D* equipment, a logical development of the earlier STR. 18C. With 100 watts output this new installation covers the frequency range 2.8—18.1 Mc/s in no less than 200 crystal controlled channels, each channel requiring one crystal. The whole equipment is designed for pilot-operated R/T as the primary function. Speech clipping circuits and voice operated auto-gain control are incorporated to ensure maximum efficiency under noisy conditions when operating R/T. On the other hand, CW and MCW facilities are available for those operators who still wish to carry a radio operator, but the whole stress has been laid on the pilot-operated telephony facility in the design.

Remote control unit for the Collins AN/ARC.52 UHF transmitter/receiver for 18 plus 2 channels. The equipment is being made under licence by Plessey.

The total weight of an STR. 18D installation, excluding cables and racking, is of the order of approximately 133 lb. The equipment may be used to radiate from a suppressed antenna, in which case this weight will be slightly increased.

An alternative installation to the STR. 18D is the *Marconi AD. 307*, which is also primarily intended for pilot-operated R/T service, although provision is made for CW and MCW operation, should this be required. The frequency range 2—24 Mc/s is covered by 200 crystal controlled channels and the power output is 100—130 watts carrier. The AD. 307 is entirely remotely controlled and self-tuning, tuning being achieved by small clutch-coupled motors.

The transmitter is provided with a speech clipping circuit, thus providing automatic control of the modulation level when radiating R/T. In addition, a carrier-operated anti-noise device is incorporated, and the receiver is provided with an effective auto-gain control. The weight of a typical installation, with two control positions (cf. photos), but less cables and racking, would be approximately 145 lb.

Pye's VHF Gliderphone (foreground) for gliders is fed by a 90 volt/1.5 volt dry battery and has a range of up to 80 miles. Behind are other Pye products.

*

So much for the long-range HF-communications equipment. For use in conditions where long range facilities are not required the obvious choice is VHF, or UHF R/T. It is well known that the VHF and UHF frequency bands offer extremely clear reception and transmission, with almost complete freedom from static interference. In addition, the airborne equipment is extremely light and compact, and is simple to operate.

Perhaps the most popular of contemporary British VHF airborne installations is the *Standard STR. 12D*. This equipment is designed to provide 140 channels, with 100 kc/s spacing, in the band 118.0—131.9 Mc/s, although at present the equipment is supplied to operate on 70 channels, with 200 kc/s spacing. This is because current VHF ground facilities fail to meet the frequency tolerances laid down by I.C.A.O. The STR. 12D is operated by a press to talk switch associated with the microphone. The channel selection is achieved by means of two knobs carried on a small control unit, one knob selecting the channel frequency whole number in Mc/s, the other the decimal. The control unit also carries the crystals and crystal oscillators, and an "Off-On" switch. A second switch enables MCW telegraphy to be selected, if required.—The actual number of crystals required varies according to the number of channels, 24 crystals being needed to provide for 70 channels, while 34 crystals will cover the entire 140 channels. The output of the STR. 12D is a minimum of 10 watts over the entire band, while the weight of the equipment is 37¼ lb.

(In addition there is the *Standard STR. 9Z* small 44-channel transmitter/receiver shown at Farnborough for the first time this year. Designed for touring and military aircraft, it can be supplied for four different frequency ranges, e. g., 115—145 Mc/s. A particularly interesting point about this equipment is that its dimensions and weight are almost identical to those of the older STR. 9 ten-channel transmitter/receiver—in widespread use—and can thus replace the old installation without additional costs. The manufacturers even supply modification kits with the aid of which existing 10-channel sets can be converted to 44 channels.—Weight of the STR. 9Z—without crystals or connectors—25½ lb.; power supply 26 volts D. C.; output power 5 watts. –Ed.)

Another VHF installation for transport aircraft, the *Marconi AD. 115*, also provides (like the STR. 12D) 140 channels with 100 kc/s spacing. The equipment covers the frequency band 118—132 Mc/s, and transmission and reception on differing frequencies may be provided, if required. Only 24 crystals are required to cover the complete range in 140 channels; channel selection is by means of two rotary switches, as in the case of the STR. 12D. A single small control unit is used, and this carries the channel selection knobs, an "Off-On" switch, and an R/T or MCW selection switch. The output power of the AD. 115 is 15—20 watts, and the total weight, less cables, is 33.7 lb.

At present UHF working is almost entirely restricted to Service use. As a result, very little information is available on current UHF equipment. In the United Kingdom the *Plessey Group of Companies* are to produce an American airborne transmitter-receiver under licence from the *Collins Radio Company*. Known as the *AN/ARC. 52*, this compact piece of equipment provides R/T facilities in the range 225.0—399.9 Mc/s, this range being covered by 1,750 frequency channels, of which 18 are available to the pilot at any time. An entirely independent secondary reception channel within the range 238—248 Mc/s is provided as an emergency guard. In addition, ADF facilities, using a UHF ground beacon and a suitable airborne indicator, are available. No weight details are available, but the transmitter/receiver unit only measures 21" × 10⅛" × 7³/₁₆".

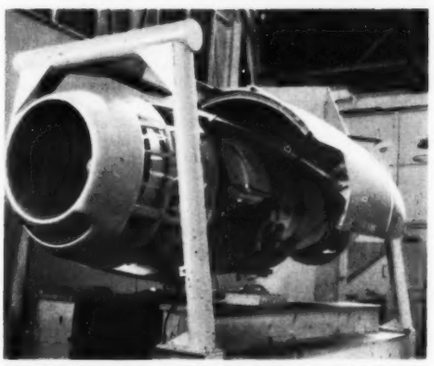
Mock-Up Inspection at Santa Monica

The mighty Douglas DC-8 four-jet long-range commercial transport, which is being built at the Santa Monica, California plant in several, externally identical versions for eleven leading international airlines, was ordered straight off the drawing board, no prototype being made in order to save time. So as nevertheless to obtain reliable bases for solving the many thorny equipment problems, Douglas has built a full-size mock-up of the DC-8.*

Constructed almost entirely of wood, the mock-up has only certain key components in metal. For economy's sake and hangar space reasons it has only one wing and, at present, the main portion of the fuselage, including cabin and flight deck. It is planned, however, to add the tail cone and empennage with its full controls later. Ailerons and landing flaps function, and the undercarriage units can be extended and retracted in the same way as projected for the production models. An "atmosphere of realistic simulation" thus backs the DC-8's detail designers in their frequently complicated task. They can study the installation problems of complete systems or individual equipments in their relation to the complete aircraft and in all their functional aspects, before making any final decision.

* The differences between the four versions hitherto planned—engine type, range, gross weight, wing and fuselage structure, undercarriage—were described in greater detail in *Interavia* No. 3, 1956, p. 174 etc. So far firm orders have been placed for a total of 115 DC-8s, and options taken on roughly another fifty.

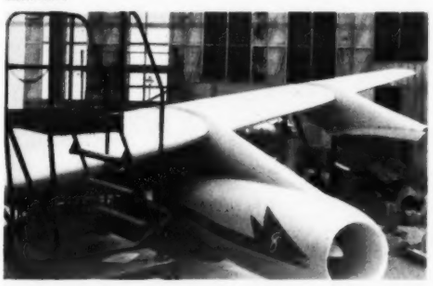
To save space and costs, the full-scale mock-up of the DC-8 is equipped with only one wing . . .

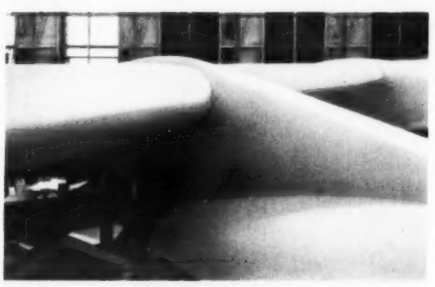


The engine mock-up for the DC-8 (J-57 or J-75 ?) with full cowling.

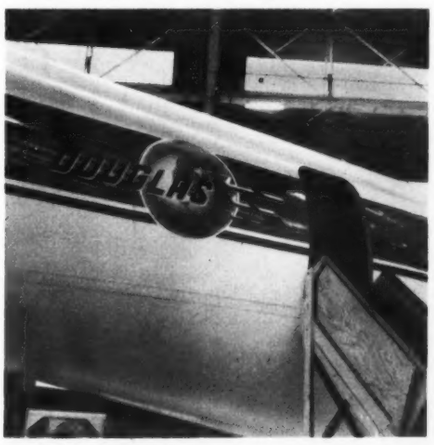
. . . the port wing, which spans 69 ft 10 ½ins. from the fuselage centre and is equipped with realistic flaps and ailerons.

Simpler engine mock-ups are attached to the wing on solid pylons.





The rear starboard door for the crew.



The fuselage at present extends only to the cabin's rear pressure-tight bulkhead; a complete tail unit will be added later.

What's in the Air?

Extracts from Interavia Air Letter, *daily international news digest, in English, French and German. All rights reserved.*

● **The International Civil Aviation Organization** has been awarded the "Prix International des Communications Christophe Colomb" in recognition of the work done by this special organization of the United Nations in the field of world air transport.—The prize is given to the person or institution which, during the preceding four years, has made the greatest contribution to progress in transport as a means of promoting understanding and cooperation between nations.

● **Sabena** is to increase the number of helicopter services between Belgium, the Netherlands and Germany. As from November 1st, ten flights a week in both directions will be made on the Brussels–Liège–Maastricht–Cologne route. After January 1st, 1957, four of these flights will also include Bonn. The Brussels–Eindhoven–Duisburg–Dortmund service will be flown daily, and in addition there will be three flights a week from Brussels to Eindhoven only. At the beginning of next year, this latter service will be extended to the Ruhr area. At that time there will be two helicopter links daily between Brussels and the Ruhr area. With effect from November 1st nine services a week will be maintained on the Brussels–Antwerp–Rotterdam route, to be increased to twelve on January 1st.

● **Three services a day** now connect Berlin and Moscow. Two of them are operated by Aeroflot and the third by the East German Lufthansa. Intermediate landings are made at Warsaw and Vilnjus (formerly Vilna). Fares are DM 328 single and DM 590 return.

● **Vienna-Schwechat airport** is to be modernized by the provision of up-to-date passenger and freight handling facilities under a 130,000,000-schilling expansion programme. The runways are also to be lengthened, at first to 3,280 yards and by 1958 to 3,830 yards.

● **The U.S. Civil Aeronautics Administration** has sent a team of six specialists to Afghanistan to give technical assistance and guidance in the development of a department of civil aviation in that country. The group is sponsored by the International Cooperation Administration which plans loans and expenditures totalling $ 14,560,000 to expand air transportation facilities in Afghanistan. Four all-weather airports and a number of landing strips will be built. The fields with which the C.A.A. will help are at Kandahar (international airport with an 8,200-ft. concrete runway) and others at Kunchez, Herat and Jalalabad. Meanwhile, Russian help is being given in the construction of an airport at the capital Kabul.

James T. Pyle (right), acting administrator of the U.S. Civil Aeronautics Administration, took over the controls of the Boeing 707 – the prototype for both the KC-135 tanker and its commercial transport versions – during a demonstration flight at Seattle.

Lawrence D. Bell died on October 20th, at the age of 62. Only a short time before he had been obliged, for health reasons, to resign as Chairman of the Board of the company which he founded in 1935. New President of Bell Aircraft Corp. is Leston P. Faneuf, hitherto Vice President and General Manager (right).

● **Douglas Aircraft Co.**'s earnings for the nine months ended August 31st totalled $ 20,595,609, or $ 5.56 per share, compared with $ 23,368,508 or $ 6.33 in the same three quarters of last year. Provision for taxes amounted to $ 20,980,521 ($ 25,145,250) on sales of $ 711,285,995 ($ 676,157,313). Increased development costs, largely attributable to new activities in the commercial DC-8 and DC-9 programmes, are described as accounting for the drop in earnings this year.

INDUSTRY

● **The Fairey Rotodyne** is being closely studied by several countries, including Japan, who is planning to set up a chain of heliports. Interest is also being shown in the United States, where the President of New York Airways has hinted that his company may follow the example of Capital Airlines and order flying equipment in Britain. The *Rotodyne's* vertical take-off rate is 1,670 ft./min, and its cruising speed 175 m.p.h., whereas the helicopter with 40 to 50 seats which the company has been considering for 1960 has only a climb rate of 600 ft./min and a cruising speed of 125 m.p.h.—Although at one time the British Ministry of Supply was in the process of axing all helicopters not regarded as a direct military requirement, there now seems little doubt that Ministry support for the *Rotodyne* will be maintained. The prototype is so near the flight test stage and so much commercial interest is being shown that the Ministry has been content to let the project go on. One of the factors influencing this attitude has been the recent increase in enthusiasm by B.E.A., which is now making a close analysis of the *Rotodyne* for all its proposed helicopter routes.

● **Dunlop Rubber Co.** has installed a machine permitting simultaneous testing of aircraft wheels, brakes and tyres. The installation, the first of its kind to be erected in Britain, cost more than £ 100,000 and permits simulation of landing speeds of up to 200 m.p.h.

● **The Royal Netherlands Aircraft Factories Fokker** have firm orders for a total of twenty-six F.27 *Friendship* airliners, plus options for 15 more. Fairchild Engine & Airplane Corp., which is producing the F.27 under licence, has sold 31 and granted options for another 29, bringing the overall figures for both companies to 57 sales and 44 options. Fokker plans to complete five *Friendships* in 1958,

Demonstration of the Dassault *Etendard IV* light-weight fighter at Bordeaux-Mérignac. SNECMA-Atar turbojet of 7,720 lbs. thrust; gross weight 12,120 to 14,330 lbs. according to mission; supersonic speeds in level flight; two 30-mm DEFA cannon; Messier undercarriage; take-off and landing distance 550 yards; use of grass fields possible thanks to special undercarriage. Left to right: Marcel Dassault; Henri Laforest, Secretary of State for Air; Henri Desbruères, President of SNECMA; Senior Prefect Lahilonne, Prefect of the Department of Gironde.

48 in 1959 and 72 in 1960, and Fairchild is to manufacture ten a month as from 1958.

● **S.A.B.C.A.,** Société Anonyme Belge de Constructions Aéronautiques, has concluded an agreement with Royal Netherlands Aircraft Factories Fokker under which it will produce tooling for the Fokker plant. In addition, S.A.B.C.A. is interested in acquiring sub-contracts for *Friendship* parts.

● **Wiener Neustädter Flugzeugwerft AG.** is the name of a new firm being organized in Austria, with 51% of its share capital to be held by private Austrian interests, and the remainder by a Swiss financing company and by Bristol Aeroplane Co. The latter company is reported to have undertaken to help the new enterprise to equip its plant. It is planned to acquire the Wiener-Neustadt plant of Oesterreichische Flugzeugwerke GmbH, which is under liquidation, and to concentrate on maintenance and overhaul work. Later, licence manufacture of aircraft and helicopters is envisaged.

● **Boeing Airplane Co.** announces the sale of 134 Boeing 707 jet transports, covered by contracts or letters of intent to buy. Nine airlines have formally stated that they have ordered a total of 98 707s: Pan American World Airways (23), American Airlines (30), T.W.A. (8), Continental Air Lines (4), Braniff Airways (5), Sabena (4), Lufthansa (4), Air France (10), Qantas (7) and Air India International (3). The airlines who have ordered the remaining 36 aircraft are not revealed, though British Overseas Airways Corporation is known to be interested in 10 to 17, and informed circles believe that 19 additional aircraft have been ordered for T.W.A.

● **The U.S. Atomic Energy Commission** has been working for more than a year on a nuclear rocket propulsion project. No information has been released on how far development work has progressed, though it is admitted that scientists at both Los Alamos and Livermore Laboratory (Calif.) are engaged on the project, which is said to have tremendous implications for both military and civilian employment of atomic propulsion. It offers the possibility of overcoming the heavy handicaps which the weight of chemical fuels now imposes on the range of rockets and guided missiles. Nuclear power might also eventually solve the problem of space travel.

Four Navy jet fighters being refuelled simultaneously from a Convair R3Y-2 *Tradewind*. The latter's wing tanks contain enough fuel for eight fighters.

PERSONNEL NEWS

● **William E. Boeing,** founder of Boeing Airplane Co., died at Seattle on September 28th at the age of 75. He had retired several years previously and no longer had any financial interest in the company.

● **Sir Richard Fairey,** founder and Executive Chairman of the Fairey Aviation Company, died in London on September 30th at the age of 69. He began his career as an electrical engineer but soon switched over to aviation. In 1913 he became Chief Engineer to Short Brothers and two years later founded Fairey Aviation Company. He was Chairman of the Society of British Aircraft Constructors from 1922 to 1924 and was twice elected President of the Royal Aeronautical Society, in 1930–31 and again in 1932–33.

● **Death of François d'Astier de la Vigerie:** From Paris comes news of the death of French Air Force Lieutenant General François d'Astier de la Vigerie. Born in 1886, he attended Saint-Cyr and transferred from the infantry to the Air Force in 1915. In World War II he played a leading part in General de Gaulle's forces, and in 1945 was appointed French Ambassador to Brazil.

Dr. Giorgio Lourier has been decorated with the insignia of the Italian Republic's Order of Merit. Dr. Lourier has been a member of *Interavia's* staff since 1933.

● **Lord Hives** will retire as Chairman of Rolls-Royce Ltd. next January. He will be succeeded by Lord Kindersley, who at present is Deputy Chairman. New Deputy Chairmen will be J. D. Pearson and Whitney Straight. Pearson will replace Lord Hives as Chief Executive and continue as Managing Director of the Aero-Engine Division. W. A. Robotham has been appointed Managing Director of the Oil-Engine Division.

● **Engineer General Henri Ziegler,** formerly Managing Director of Air France and later chief of the personal staff of the Minister of Public Works, has returned to private industry. He has become Managing Director of Société RBV-Radio Industrie and has also joined the Board of Aviation Louis Breguet.

TECHNICAL NOTES

● *Escape capsules* (crew compartments which can be separated from the rest of the aircraft) for all new military aircraft with speeds of more than 600 knots and ceilings of more than 50,000 ft. are now specified by the U.S. Air Force's Air Research and Development Command. This was disclosed by Captain John W. Goodrich, of the directorate of research at Wright Air Development Center, during an Air Force-industry conference on Emergency Escape from High Performance Aircraft. The conference also brought out the fact that weight and encumbrance of personal equipment develops fatigue to the point where a pilot can fly for only a short period of time at peak efficiency and mobility.

The Ramo-Wooldridge Corporation is building a Research and Development Center outside Los Angeles. The project includes nine buildings, one of them a multi-storey administration building. Cost $10,000,000.

The Bristol *Britannia* on a demonstration tour of North America. Picture shows the aircraft approaching to land at San Diego.

● A second *Douglas C-133A* turboprop transport is now undergoing flight tests at Edwards A.F.B., California.

● Delivery of the first *Convair 880* jet commercial transport is scheduled for November 1959, and C.A.A. certification is expected to be issued by May 1960.

● The *Vickers jet project,* based on B.E.A. specifications, is now in an advanced stage. Designed for especially good take-off and landing qualities, it is to have a cruising speed of 600 m.p.h. and will probably be powered by Rolls-Royce *Conways.*

● The *Douglas B-66* twin-jet light bomber is now known as the *Destroyer.* The B-66 is in production for the U.S. Air Force's Tactical Air Command at the Douglas Long Beach, Calif., and Tulsa, Oklahoma, plants.

● The *Glenn L. Martin XB.68* supersonic bomber under development for the U.S. Air Force is said to be capable of top speeds around Mach 2, an operational altitude of considerably more than 50,000 ft. and a range of between 2,000 and 3,000 miles.

● The Italian firm of *Macchi,* of Varese, is developing a light two-seat jet trainer, the *MB.326,* for two persons; power plant is to be an Armstrong Siddeley *Viper ASV.8* turbojet of 1,750 lb. thrust.

Fiat G.91 light-weight fighter during take-off and landing, in the latter case with brake parachute extended.

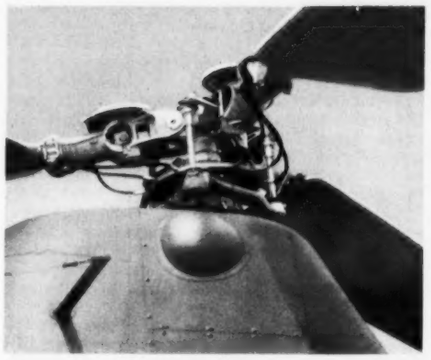
● *Saab J 29 jet fighters* have recently been observed with the "saw-tooth" in the wing leading edge (at about 2/3 of the span) already seen in other types.

● *Northern Aircraft Inc.,* of Alexandria, Minn., recently began flight testing a first Bellanca *Cruisemaster* four-seater with 230 h. p. Continental engine. The firm, managed by Roy Strong, acquired manufacturing rights for the *Cruisemaster* from Bellanca Aircraft Corporation nearly 12 month ago, slightly modified the aircraft and now plans to produce it at the rate of some four a month.

● *Two new research rockets* are being developed for the U.S. Navy by Atlantic Research Corp., Alexandria, Va. The *Iris* is designed for max. altitudes of 200 miles, and a smaller version, known as the *Arcon,* will reach max. heights of 60 to 70 miles.— The *Iris* will work on solid propellants and be used primarily for investigation of cosmic radiation etc. It is described by Navy circles as a successor to the *Viking* and the *Aerobee-Hi.*

● The University of Maryland and Republic Aviation Corporation have jointly announced the first launching of another new *research rocket, the Terrapin,* which has been built by Republic's Guided Missiles Division at Mineola, L.I., N.Y., in collaboration with the University of Maryland. The *Terrapin* is a two-stage rocket roughly 15 ft. in length, 6¼ ins. in diameter and with a launching weight of 224 lb.; solid propellant is used.— During its first test launching from N.A.C.A.'s Wallops Island centre, the *Terrapin* reached an altitude of 80 miles and a top speed of Mach 5.8.— Several dozen of these research rockets are to be built, and Republic states that work is in progress on a three-stage version (for ceilings of at least 200 miles).

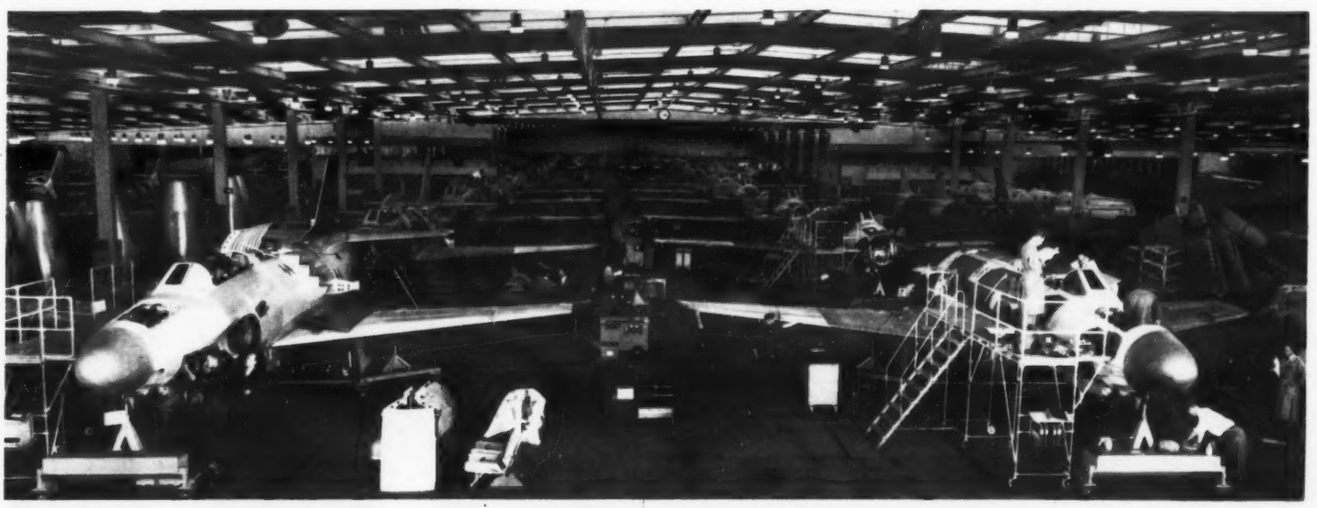
● France's *Ouest Aviation* (formerly S.N.C.A. du Sud-Ouest) has for a number of years been engaged —as a private venture—in intensive development work on guided missiles. These activities have been concerned in particular with the following projects: development of guided missiles for the *Vautour* bomber version; development of a surface-to-air missile of long range, designed as the final stage of the *Trident* development (in this connection it is reported that an entirely remote-controlled version of the *Trident* will shortly begin flight testing); and finally development of various strategic guided weapons with a new-type guidance system.



Russia's Mi-1T helicopter designed by Mikhail L. Mil and in service in large numbers.

The OK-15, an Austrian sports and touring two-seater (designer Otto Kauba, Vienna) with Walter *Minor 4-III* engine of 105 h.p. take-off power; gross weight 1,320 lbs., max. speed 135 m.p.h., cruising speed 125 m.p.h., ceiling 14,800 ft., endurance 3 ¼ hours.

The Saab-32 *Lansen* (A 32A) two-seat all-weather combat aircraft in production at Svenska Aeroplan A.B., Linköping. A number of Royal Swedish Air Force ground attack squadrons are already equipped with the *Lansen,* which is to be standard equipment for all R.S.A.F. ground attack, night fighter and reconnaissance units.



Not only with the versatile Britannia, but also in their work on helicopters, turbojets and turboprops, ramjets and guided missiles, the Bristol Group of Companies is helping to forward the scope of aviation.

THE BRITANNIA

A large part of Bristol's resources is devoted to the production of Britannia airliners and their Proteus engines.

HELICOPTERS

Bristol's research and development programmes for helicopters have resulted in large orders for single- and twin-engined machines being placed with the Group.

AERO-ENGINES

Two world altitude records have been won by an Olympus-engined Canberra. This engine is in production for Avro Vulcan bombers. Two new engines —the lightweight Orpheus and the Orion supercharged turboprop—are being intensively developed by Bristol Aero-Engines Limited.

RAMJETS AND ROCKETS

Work on rocket motors for research during the International Geophysical Year is being undertaken by the Bristol Group. Bristol are also developing guided missiles and their ramjet power units.

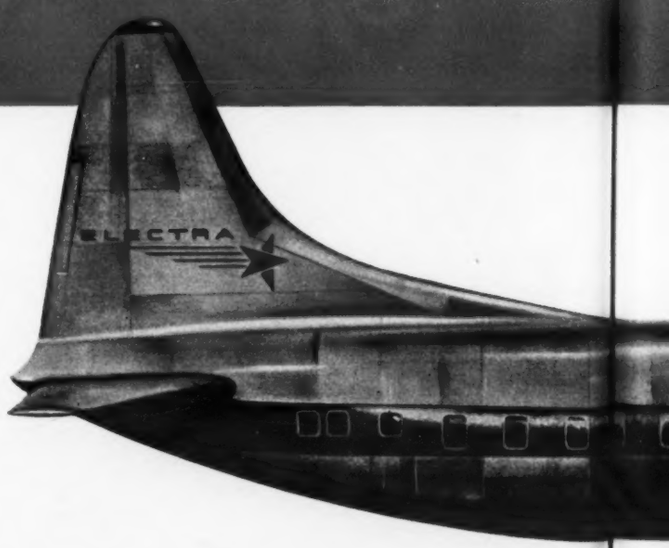
Other Bristol activities. The Group also manufactures cars and aircraft plastic drop tanks. The following companies are associated with Bristol: Rotol; British Messier; Short Brothers and Harland. There are associated and subsidiary companies in Australia, Canada, Mexico, New Zealand, France and Spain.

BRISTOL

THE BRISTOL AEROPLANE COMPANY LIMITED

You buy Lockheed

When you buy the Lockheed



For a quarter century Lockheed aeroplanes have set world standards for speed, range, economy and passenger preference. Today, a Lockheed aeroplane (military) is the world's fastest jet: a Lockheed transport (Constellation types) is a world favourite: and Lockheed is flying propjet engines on a variety of transport aeroplanes (C-130 Hercules in production at the Georgia Division and Military Propjet Super Constellations).

Now, with Lockheed's forthcoming propjet *Electra, a quarter century of design, skill and imagination results in these outstanding features:—range flexibility—100 to 3000 miles from large and small airports: faster cruising speeds: unsurpassed styling, luxury and spaciousness: ease of servicing—complete turnaround in 20 minutes.

No wonder 129 Electras have already been ordered by American Airlines, Braniff International Airways, Eastern Air Lines, KLM Royal Dutch Airlines, National Airlines, Western Air Lines.

**Powered by propjet engines, in service on C-130 Hercules. Built by Allison Division of General Motors.*

LOCKHEED AIRCRAFT CORPORATION, CALIFORNIA DIVISION, BURBANK, CALIFORNIA, U. S. A. / *Look to Lockheed for Leadership!*

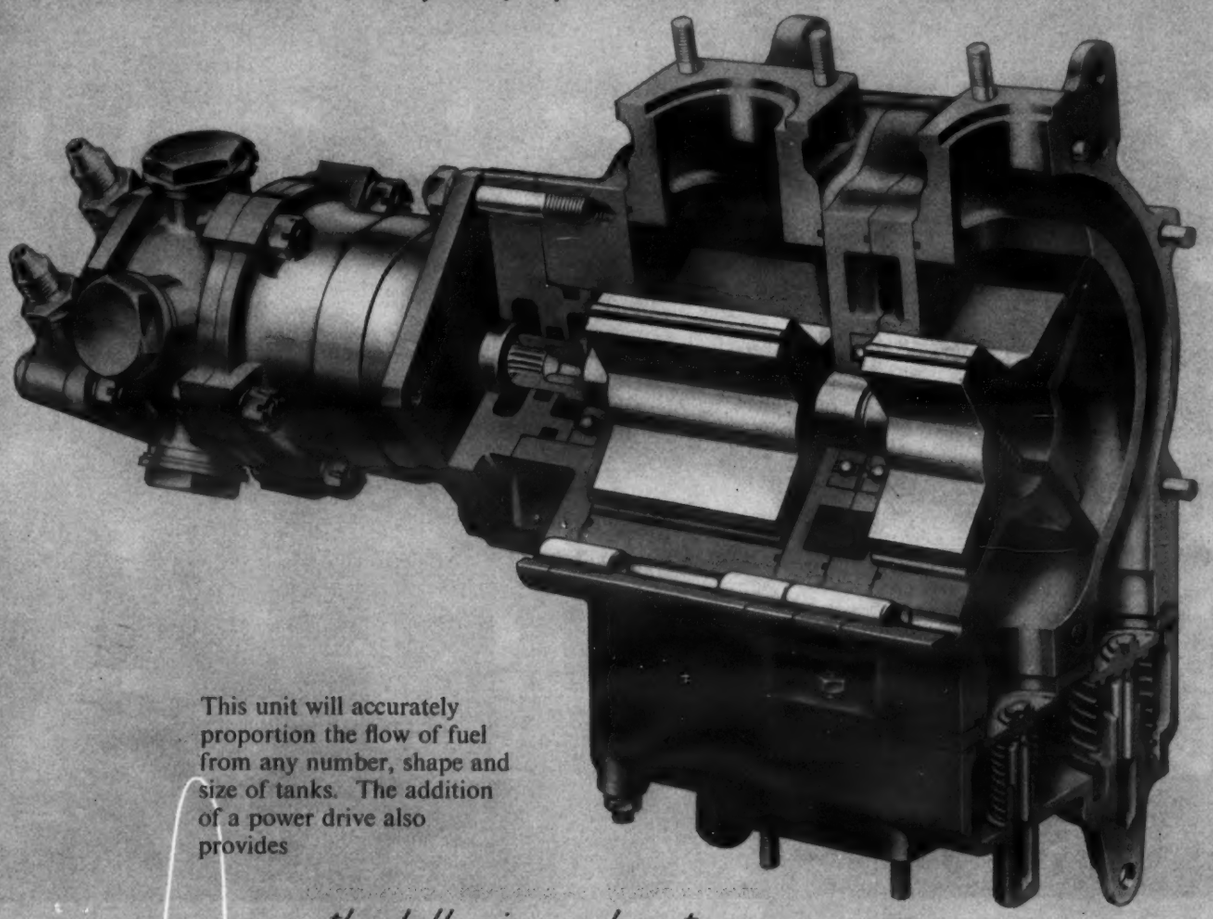
d reliability

d ELECTRA

ELECTRA
A LOCKHEED Luxury Liner

POWERED PROPORTIONER

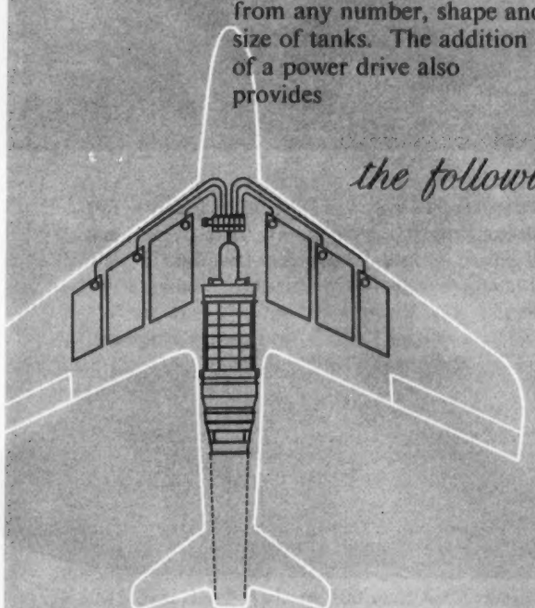
Rotol fuel flow proportioner with hydraulic motor drive



This unit will accurately proportion the flow of fuel from any number, shape and size of tanks. The addition of a power drive also provides

the following advantages

- An alternative source of fuel pressure in emergency cases.
- Additional fuel pressure at little extra cost in weight.
- Use as a backing pump providing engine pump pre-pressure.
- Proportionate refuelling at high flight refuelling rates.
- Any desired fuel pressure rise by the choice of suitable motor.



ROTOL

GLOUCESTER · ENGLAND

The Role of Electronic Computers in Aviation

BY RENÉ DERVEAUX,
PRESIDENT AND MANAGING DIRECTOR LABORATOIRES R. DERVEAUX, BOULOGNE-SUR-SEINE

Presentation on the oscilloscope of the solution supplied by an analogue computer, relating to the dynamic behaviour of an aircraft with two states of equilibrium.

Progress in aviation during recent years has been more striking than in almost any other domain, and scarcely a week passes without the announcement of some new spectacular performance. It is, however, legitimate to ask how far these advances, and the constant intensification in traffic, would have been possible without the equally great progress in electronics.

Nobody would deny the leading role which this branch of engineering has played in solving navigation problems. Nevertheless, much still remains to be done to ensure complete safety and reliability, but there can be no doubt that electronics will provide the most rational solutions.

But there is another domain, equally important though less well known, in which electronics can take a major part, that of the design and development of aircraft.

Electronic machines and the design office

Design offices are too well acquainted with the calculation difficulties involved in selecting airfoils, for example, to need convincing of the assistance that calculating machines can provide. Rheographic and electric three-dimensional flow models enable a direct presentation to be made of aerodynamic processes, and the Pérès and Malavard wing calculator and the Siestrunck propeller calculator are becoming more and more widely appreciated.

In addition, the dynamic behaviour of aircraft structures can be studied by means of large digital or analogue computers. In view of the complexity of flutter phenomena in modern aircraft, the value of electronic aids from both the technical and the economic standpoint can be readily imagined.

It is also possible to use the same type of computers in the design of propulsion units, in particular in determining the optimum flow distribution and in designing turbine blades.

The *Djinn* analogue computer (Laboratoires R. Derveaux).

In this connection it is interesting to note that, by providing rapid solutions to highly complex mathematical problems, electronic computers lead the aerodynamicist to an increasingly accurate knowledge of the laws governing the dynamics of compressible flow. No better proof of this fact can be supplied than by the value of the many interesting papers on this subject presented at the recent congress on applied mechanics in Brussels.

Electronic simulators and the mechanics of flight

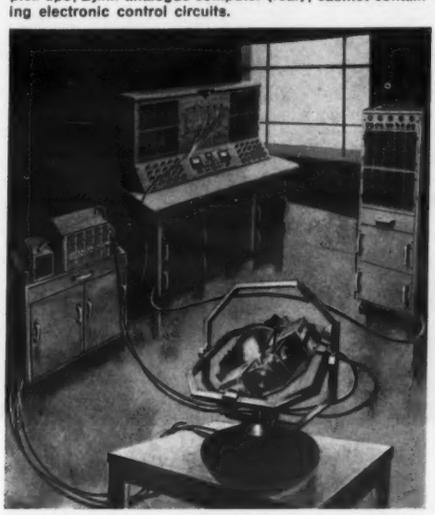
However great is the part played by computing machines in the design of airframes and power plant, the greatest services rendered by electronics during the development of a prototype are probably those in connection with the mechanics of flight. Thanks to electronic analogue computers, it is now possible to simulate directly the dynamic behaviour of an aircraft under different flight conditions and to determine directly the influence of the various aerodynamic coefficients. This permits rapid selection of the optimum basic parameters as a function of the required performance and at the same time enables the engineer to follow the progress of his work.

With the aid of these simulators such problems as the following can be tackled :

- — determination of control efficiency ;
- — determination of the rules to ensure a given type of flight (landing, climb at minimum consumption or in a minimum time, etc.) ;
- — design and development of autopilot systems.

It should be noted in particular that this method of handling such problems, with allowance for variations in aerodynamic coefficients as a direct function of flight conditions, provides an exact picture of the aircraft's possibilities and hence correspondingly reduces the amount of flight testing required.

Diagram of the analogue system for determining the parameters for an autopilot: three-axis table (foreground) with pick-ups; *Djinn* analogue computer (rear); cabinet containing electronic control circuits.



Electronics and the evaluation of flight test results

Despite the reduced number of flight tests needed, the problem of evaluating results remains a heavy burden for the flight test centres, in view of the complexity and number of measures to be carried out on modern aircraft. Here too, electronics provides the best solution, as regards both the design of measuring and recording equipment and the methods of evaluating the recordings.

Simulators for training flight personnel

Finally, mention should be made of one of electronics' most important contributions to aeronautical progress, namely simulators for training flight crews.

These machines, which provide advanced preflight training, represent the aircraft to be flown through the system of equations governing its behaviour. By operating controls which are identical with those in the real cockpit, the " pilot " introduces into the system of equations in the analogue simulator electric impulses corresponding to the orders he wishes to give. The system's response to these impulses is translated on to measuring instruments similar to those on the cockpit panel. The pilot therefore " flies " under exactly the same conditions as in a real aircraft. In some simulators the cabin itself makes the same movements as the aircraft under similar conditions.

*

Later articles will give details of the applications of electronic computers in aviation and discuss, by means of examples, the present possibilities and limitations of these methods.

The object of the present brief survey has been to indicate the value of the new methods. On the one hand they tackle the most difficult mathematic problems, such as would discourage even the most competent of engineers, and at the same time enable the latter to keep a constant check on the progress of their work. On the other, they permit substantial economies to be made both in the design of equipment and in the training of pilots.

No mention has been made of the aid which electronics can supply in aircraft production, in particular of the application of automation, since despite its importance it is not peculiar to the aircraft industry and thus falls outside the scope of this article.

RECENT AMERICAN WIND TUNNELS

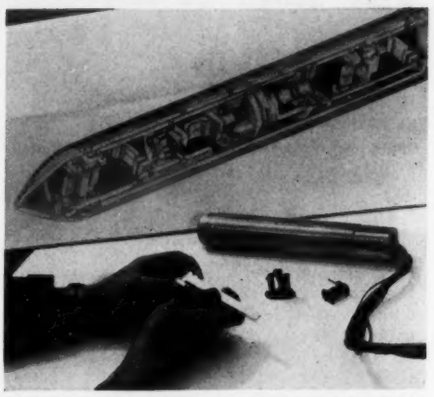
The Southern California Cooperative Wind Tunnel

At the end of April this year the *Southern California Cooperative Wind Tunnel* in Pasadena, one of the world's biggest private wind tunnel installations, was taken into operation again after an elaborate modification programme lasting several years. The installations, which are jointly owned by five U.S. aircraft manufacturers, have been modernized at a cost of $8,000,000 and can now be used for tests at flow speeds of up to Mach 1.8. The test section measures 8 1/2 × 11 1/4 ft. and can thus take models of up to 8 ft. in span. With a model 12 ins. in length Reynolds Numbers of up to 11×10^6 can be obtained.

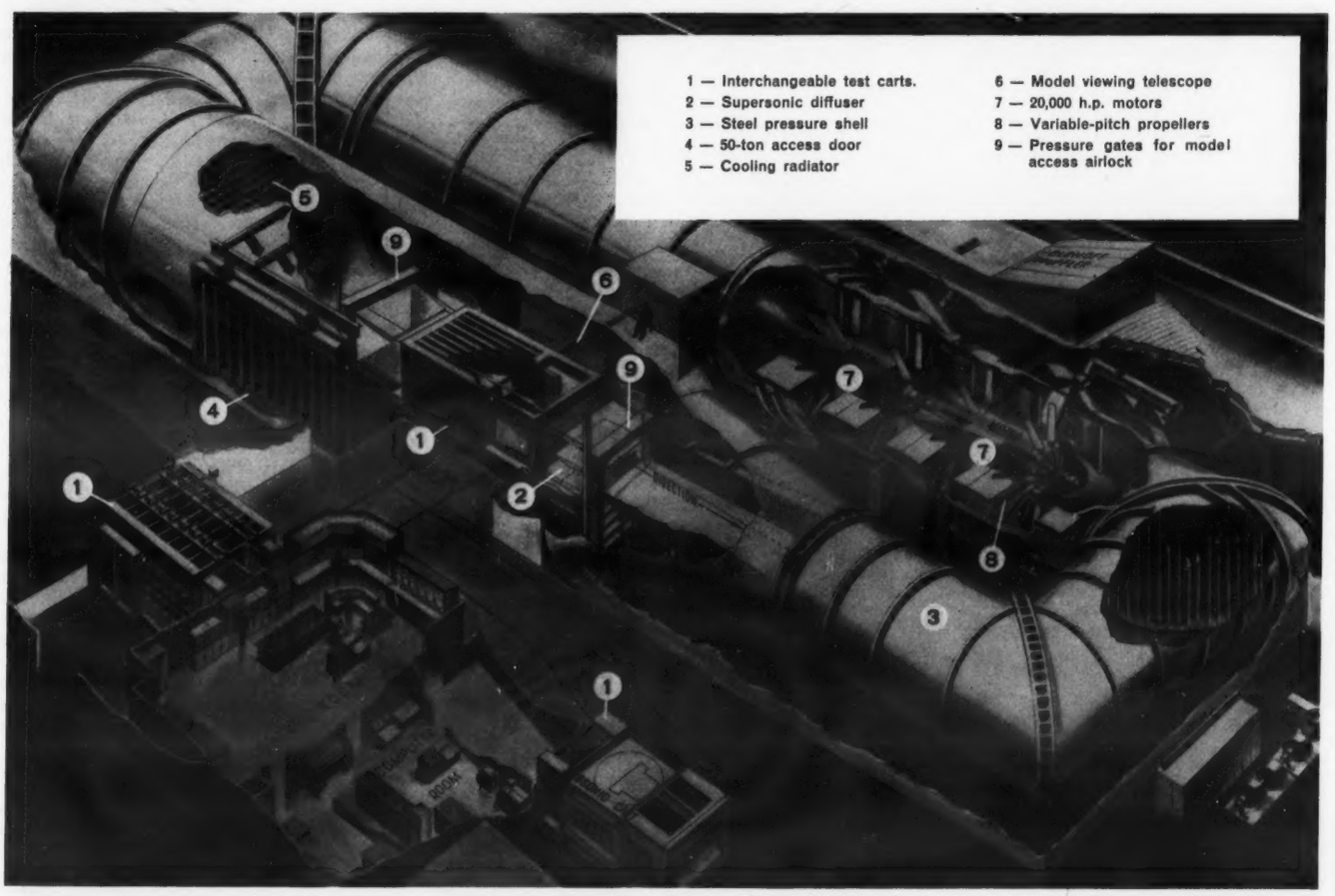
The original tunnel was designed in 1941 by a design group at the California Institute of Technology. It was financed by four aircraft companies: Douglas (1/3), Convair (1/3), Lockheed (1/6) and North American (1/6). In the summer of 1948, three years after the tunnel was placed in operation, McDonnell Aircraft Corporation purchased half of Convair's share, and since that date all five companies have used it jointly. The installations are operated by the California Institute of Technology. In 1951 the owner companies decided to undertake an extensive modernization programme. Contracts for certain major elements were awarded to Sandberg-Serrell Corporation and to Westinghouse Electric and Manufacturing Company. For example, two 20,000 h.p. synchronous motors were installed, which produce sufficient flow energy for realistic measurements in the transonic and supersonic ranges. The original tunnel completed in 1945 cost $2,500,000, but today's replacement value of the complete installation has risen to $14,000.000.

The general lay-out is shown in the diagram below. Special features are the three interchangeable test sections or "carts" (subsonic, transonic and supersonic), each of which is wheel-mounted and self-propelled on a track system. While the subsonic test section is of the conventional solid-wall variety, the transonic section has ventilated walls (to prevent the test section from being blocked by vertical shock waves). The latter can be used for investigations at speeds up to Mach 1.3. The supersonic test section is a flexible nozzle throat and is designed for maximum flow speeds of Mach 1.8.

The test section is separated from the rest of the tunnel by gate valves which hermetically seal it when required. During normal operation the valves are sunk in the tunnel floor, but are raised before the test section is opened or exchanged. Thus, the latter can be equalized to atmospheric pressure within



Miniature precision balance with horizontal model support. The balance, which is installed inside the model, has a number of strain gauges mounted in oil, whose signals are transmitted by electric cables to indicators in the control room.


1 — Interchangeable test carts.
2 — Supersonic diffuser
3 — Steel pressure shell
4 — 50-ton access door
5 — Cooling radiator
6 — Model viewing telescope
7 — 20,000 h.p. motors
8 — Variable-pitch propellers
9 — Pressure gates for model access airlock
CONTROL ROOM

Artist's diagram of the Southern California Cooperative Wind Tunnel at Pasadena. Left foreground, the control room and adjacent computer room. The transonic test section, or cart, is shown in the tunnel, while the supersonic cart (left of the control room) and the subsonic cart (right) are being prepared for the next series of tests.

a short time, without the working pressure in the rest of the tunnel being changed. The value of these valves is illustrated by the fact that the tunnel can be operated at all pressures between 0.1 and 4 amospheres.

When measurements are complete, the electrically-driven cart is rolled out of the tunnel and into its equipment station, where instrumentation for the next test is prepared. Meanwhile, one of the other carts has been wheeled into the tunnel, so that the facility can be kept in almost constant operation.

Originally only two blower stages were provided, both driven by electric motors outside the tunnel (total power 13,000 h.p.). The new installation has four hubs and two motors totalling 40,000 h.p. with a synchronous speed of 600 r.p.m. The latter are supplied with 34,000 volt current by the Pasadena Municipal Power Company. Each hub has 16 forged aluminium blades with remote pitch control. The nacelle housing the motors and fan assemblies is 12 ft. in diameter and 80 ft. long.

No fine control of temperature is provided, though it is kept within certain limits by two copper-fin type radiators. These are capable of removing a total of 1,700,000 BTU per minute from the air. Two cooling towers cool water (10,600 gallons a minute) for the radiators.

So that every conceivable type of measurement can be made, many different support systems are provided for each test section: swept struts (single and three-point), three-point straight struts, sting supports and reflection plane mounts for half-span models. Other types of support, such as stranded cables, are also available. A large number of balances are provided for measuring aerodynamic forces. The largest is designed to measure lifting forces up to 30,000 lbs. and down to a fraction of a pound. Special precision balances are available for sting-mounted models, working on the strain gauge principle. These have to be small enough to fit inside the model.

Many types of measurement other than forces and moments are made during testing: recording pressures at various points on the model or tunnel; shadowgraph pictures for the determination of shock patterns produced by the model or the support devices; tuft pictures to determine flow direction on aerodynamic surfaces; dynamic force or pressure recording to measure buffeting etc.; a Schlieren system to study shock patterns, determine Mach numbers at various points in the test section, etc.

Almost all measurements are recorded automatically. The operator has only to press the appropriate button, and the data are punched on an I.B.M. card and printed on a tabular sheet. A number of electronic computers are set up adjacent to the control room to evaluate data within a matter of seconds. The immediate evaluation of the automatically recorded data also makes it possible to detect possible measurement errors or functional defects immediately after the test.

Models of the following aircraft and guided missiles were tested in the Cooperative Wind Tunnel before its modification: McDonnell F-101 *Voodoo*, Convair F-102, Convair B-58 *Hustler*, Douglas *Nike*, North American *Navaho* and Douglas/Sperry *Sparrow*.

Unitary Wind Tunnels for N.A.C.A.

Three new wind tunnel facilities for speed ranges from 500 m.p.h. to Mach 5.0 went into operation last year at N.A.C.A.'s laboratories at Langley Field, Va., Moffett Field, Calif., and Cleveland, Ohio. Construction was authorized under the Unitary Plan Wind Tunnel Act passed by Congress in 1949, which provides for close coordination in the planning of up-to-date research facilities, including a number of new wind tunnels to be built with Government funds and made available to N.A.C.A. and the U.S. armed services' research organizations. In view of the extremely high costs involved—estimated at the time at over $ 1,000,000,000— it was realized that such a unified plan was essential.

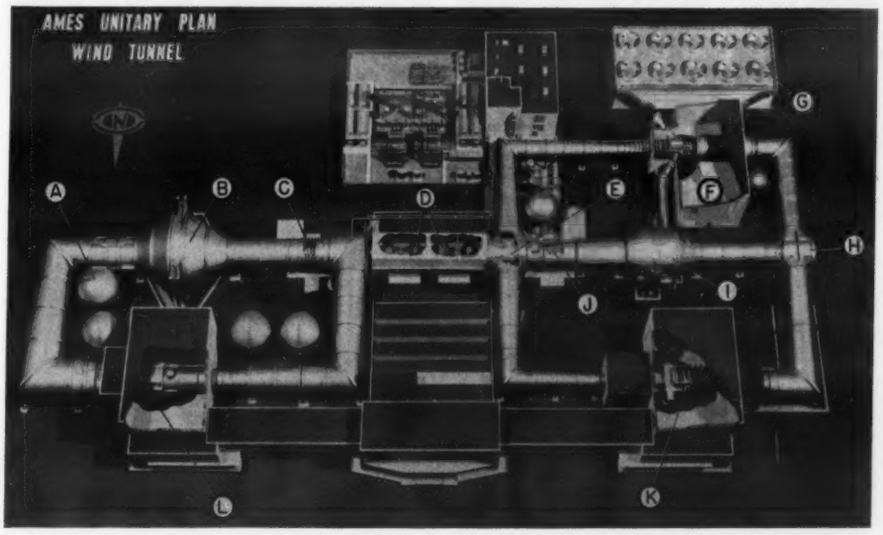
The first of the three new installations was completed at *Langley Aeronautical Laboratory* early in 1955 and underwent calibration tests the same summer. It is designed for an operating speed range of Mach 1.2 to 5.0, for aerodynamic studies of aircraft and guided missiles. Its two test sections measure 4×4 ft.

Of an entirely new design, the facility at the *Ames Aeronautical Laboratory*, Moffett Field (see picture), has three air circuits driven by a single power source *D*. The latter consists of a group of electric motors driving a single shaft and delivering roughly 180,000 h.p. One of the tunnel components, a slotted 11×11 ft. transonic test section, permits aerodynamic studies on models between Mach 0.7 and 1.5. In this tunnel branch the air is circulated by a three-stage axial flow fan *C* which is coupled directly to the central motor group. The other two circuits of the Ames tunnel, designed for supersonic studies, are driven by an 11-stage axial flow compressor placed in a common air passage in the middle of the rectangular tunnel ducting. The rotor of this compressor, measuring 22 ft. in diameter and weighing 450 tons, is the largest of its type in the world operating today. It discharges air into the tunnel circuit at the rate of 90 tons per minute. Huge flow diversion valves *H* direct this air stream through either a 9×7 ft. test section *K* (for flow velocities of Mach 1.4 to 2.6) or an 8×7 ft. test section *F* (Mach number range of 2.4 to 3.5). Though only one of the three test sections is used at a time, the measuring period is normally long enough for the other two sections to be prepared and instrumented for other tests.

The third Unitary tunnel, the supersonic wind tunnel at Lewis Flight Propulsion Laboratory, Cleveland, is one of the world's most powerful installations, with a 250,000 h.p. electric drive. Designed for testing propulsion systems and engine components, the Lewis tunnel operates in the speed range from Mach 2.0 to 3.5 and at pressures simulating altitudes up to 100,000 ft.

All of the tunnels are equipped with advanced electronic computing machines, which are able to reduce the complex test results quickly and plot them on charts while the run is in progress.

The Unitary Wind Tunnel at Ames Aeronautical Laboratory, Moffett Field: A — dry air storage spheres; B — aftercooler; C — three-stage axial flow fan; D — drive motors; E — flow diversion valve; F — 8×7 ft. supersonic test section; G — cooling tower; H — flow diverter; I — aftercooler; J — 11-stage axial flow compressor; K — 9×7 ft. supersonic test section; L — 11×11 ft. transonic test section.



BONN:

The Slow Pace of Rearmament

by Interavia's **Frankfurt** Correspondent

On September 24th the new German Air Force took over the first Lockheed T-33 jet trainers provided by the U.S. Air Force and presented the first ten jet pilots with their licences. Defence Minister Theodor Blank (centre right) and Air Force Inspector Lieutenant General J. Kammhuber (to his left).

The birth of the new German Air Force was officially celebrated at Fürstenfeldbruck air base on September 24th, 1956 at a military ceremony organized jointly by the American and German authorities. Since that day German military aircraft have carried the " Iron Cross " insignia on their fuselage and wings. At the same time the first ten German jet pilots received their licences and began the last stage of their training, on operational aircraft. Only the initiated are aware of the years of often discouraging preparatory work that have made this modest beginning possible.

During the coming weeks Government and Parliament are to make important decisions on the length of service, the organization law for the *Bundeswehr*, the supply of weapons and the provision of funds for the services. However, West Germany is in that state of uncertainty which experience has shown to be common during the last year before national elections in democratic countries. The experts therefore have some reason to fear that they will have to face half-way decisions or even postponements until after the elections in the autumn of 1957.

The *Bundeswehr* has meanwhile become an entity, and its uniforms are now a familiar—if not always popular—sight in Germany's streets. Yet the overall organization of the Defence Ministry has still not been finalized. Though the division into a military and an administrative column appears to be certain, the organization of the technical and defence economic side of the Ministry continues to produce headaches. A particularly likely candidate for the post of head of Section XII, " Research and Development " is generally considered to be Dr. Hertz, at present head of the Federal Post Office's central telecommunications bureau, who may perhaps even be regarded as a future Under-Secretary of State for Armament. Meanwhile, however, it is still not settled whether the Defence Ministry is to have one or three secretaries of state, for military, administrative and technical questions. The final answer will be provided by the organization bill.

*

Meanwhile, the roughly 50,000 *Bundeswehr* volunteers are having to cope with the shortcomings of the past six years' preparations.

It would be unjust to blame only the military planners for the absence of adequate accommodation even for the present modest flow of volunteers. Nor are the military responsible for the lack of regulations regarding pay, medical care and rations for the troops. Responsibility here falls on the civilian military administration, which for years has jealously guarded its independence and shunned all military organization.

The reason for the extremely slow pace at which decisive questions relating to technical equipment for the *Bundeswehr* are being handled by the competent committees is to be found in the shortage of personnel. So far the Federal Finance Minister has failed to allow the armament sections of the Defence Ministry a sufficient number of technical staff. An added difficulty is that appointments were made and space allocated to the Ministry's technical sections under the anti-military planning of Bonn's top administration.

The clearer planning of Secretary of State Dr. Rust, which is welcomed by the experts, is making only gradual headway. It is rumoured that Dr. Rust plans to separate from Ministerial Director Dr. Holtz, who has for many years been deputy to Defence Minister Blank and is now head of Section X (Defence Economy). Dr. Lorsch was already replaced several months ago as head of the Accommodation and Real Estate Section by Ministerial Director Schiffers.

The purely military side of rearmament preparations is still in the hands of officers with little experience of civil service practices who, despite good intentions and a deliberately cultivated " aura ", fail to muster sufficient determination to carry the day against hardened civil servants.

After the break-down of the European Defence Community project, which called for the progressive creation of German contingents for integration in Allied units, no new plan was found for the rearmament that now had to be carried through under different conditions. Though this failing can be chalked up against the military as " lack of imagination ", the basic responsibility lies with the Government and Parliament, whose factual aid began so late that it can now have little constructive effect and tends rather to delay the formation of the units. For years the military section of the former " Blank Office " had insisted on a " warming-up " period of some twelve months before actual constitution of the units began. This time was to be used for organizing skeleton staffs and selecting and training the former officers and NCOs that were to serve as instructors. For political reasons, however, this preliminary period was cut out, and the whole preparatory work transferred to the first official phase of building up the troops... with the result that the time allowed for setting up the *Bundeswehr* was reduced by twelve months. Hence the overhasty nature of German rearmament and its lack of adequate preparation.

Lockheed T-33 two-seat jet trainer in the hangar at Fürstenfeldbruck base.

"ENGINEERS AND NATIONAL DEFENCE"

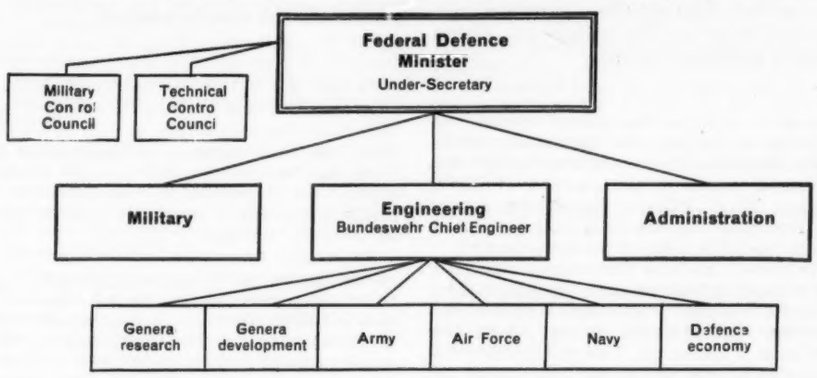
Proposal by the Verein Deutscher Ingenieure (VDI)

The problem of building up the German Defence Ministry's technical services is proving a hard nut for the responsible planners to crack. In any event, the present ministerial organization for technical arms questions is scarcely in a position to give the military competent advice on equipment procurement.

This situation is causing serious concern not only in political circles but also among engineers. The **Verein Deutscher Ingenieure** (Association of German Engineers) therefore circulated a first memorandum, entitled " Engineers and National Defence ", among members of the Federal Parliament's Defence Committee in April this year. A second, abbreviated version was published in September. The main point in this memorandum is the proposal that a **Bundeswehr Chief Engineer** should be appointed, to be responsible to the Defence Minister for all technical aspects of defence. The technical sections of the Army, Air Force and Navy should all be under the control of this Chief Engineer.

The memorandum states verbatim : " To meet the high requirements of defence engineering a highly qualified and efficient **engineer corps** is needed, led by the **Bundeswehr** Chief Engineer. The latter should be responsible for directing the engineering staff. It will only be possible to form this corps if engineers are given a real opportunity to use their talents and to advance to the highest ranks. Only in this way can good personnel be recruited, and only under these conditions can high demands be made of these engineers. In addition to a full military training the following are required : knowledge of the technical side of military service or of the technical testing field ; participation in weapons training courses and manoeuvres ; seconding to industry ; and, for the highest posts, basic staff training..."

VDI Plan for the Organization of the Federal Defence Ministry (August 1955)



However that may be, discussion of rearmament targets and the correctness or otherwise of Bonn's planning has already begun in Parliamentary circles. This may perhaps lead to a long-overdue reform, and it is now conceivable that German rearmament may be saved at the last moment from ignoring the lessons of recent technical developments. For example, the Parliamentary committees which examined Defence Ministry plans for arms purchases abroad sharply criticized the Ministry's military and technical preparations.

*

This is also the basic situation confronting the Air Force and its Inspector, Lieutenant General J. Kammhuber, appointed in June 1956.

On taking up his post General Kammhuber found the same old programme in force under which twenty squadrons were to be formed by 1960, namely 8 fighter-bomber, 4 fighter, 3 all-weather fighter, 3 reconnaissance, and 2 transport squadrons. On formation, these units are to come under the command, as a tactical air force, of S.H.A.P.E. in Paris.

As this programme did not make sufficient allowance for West Germany's peculiar geographical position, General Kammhuber will be obliged to create additional flying and ground units for home air defence, an expansion plan which has meanwhile been approved by both German authorities and N.A.T.O.

But before there can be any question of carrying out this programme, pilots and technical personnel must be trained.

Training is thus the need of the hour ... However, a first disappointment has already been recorded.The original plan for retraining former pilots has proved unsatisfactory, since the resulting percentage of suitable personnel is far too small to justify the effort. General Kammhuber therefore has to fall back exclusively on the young officer cadets who began their initial training last spring. As, however, the former Luftwaffe pilots were firmly counted on to provide instructors, there is now a sensible lack of training personnel which must be overcome at all costs if the target dates for setting up German squadrons, dictated by political considerations, are to be met. Contrary to earlier intentions, the U.S. military authorities have therefore been asked to leave instructors in Germany and to make available additional training facilities in the United States.

How great General Kammhuber's problems are regarding the training of future pilots is revealed by the fact that he would like to make the purchase of another two or three squadrons of Canadair *Sabres* (75 of these aircraft have been presented to Germany by the Canadian Government) conditional on the training of an additional 400 German pilots in Canada.

Only when the training question has been settled can aircraft be procured for the squadrons which are to be formed by 1959-60. General Kammhuber would naturally like his aircraft to be as up-to-date as possible when the units are constituted. Little concern is felt about the equipment, under the American military aid programme, of the fighter-bomber squadrons with Republic F-84F *Thunderstreaks*, and of the transport squadrons with the Nord 2501 *Noratlas*, many of which will be built under licence in Germany. On the other hand, the choice of equipment for the fighter and all-weather squadrons is causing considerable anxiety. By 1959-60 the Canadair *Sabre* will no longer be up-to-date, although it can be used for training purposes for some long time to come. For similar reasons the Air Force is hesitating to order the F-86K *Sabre* built by Fiat under licence or the North American F-100 *Super Sabre* for its all-weather fighter units. As, however, the tactical squadrons have to be ready by the end of 1960, it seems likely that General Kammhuber will have to make a definite decision some time during 1957. Whether he will obtain permission to set up, as an initial step, only training and experimental squadrons using a variety of aircraft types remains to be seen. It may be assumed, however, that he—in agreement with the responsible politicians—would prefer some such transition solution, for both financial and technical reasons.

As regards the German aircraft industry, it is clear that it is not at present in a position to supply combat aircraft. It is also clear that the present ministerial organization for technical armament questions cannot advise General Kammhuber competently. Industry and Government agencies are timidly beginning to move, but no real cooperation can be expected from them until requirements are settled and the necessary funds provided. Defining requirements will be General Kammhuber's job ; the question of finance will have to be tackled by Finance Minister Schäffer's successor. If positive steps are not taken, the recent increase in the emigration of young technical and scientific staff to foreign countries, where well-paid jobs are awaiting them, will be impossible to stem. The revived German aeronautical research establishments are also short of money and of staff.

It is certain that General Kammhuber will not simply ignore these problems. There may even perhaps be some truth in the oft-repeated assertion that, failing other promoters of the idea, he is decided to put forward and defend a demand for concentration of human and economic resources and creation of a coordinated authority for all aviation questions.

*

As these lines went to press came news of a reshuffle in Adenauer's Cabinet (October 16th, 1956). Four ministers have been replaced, including Defence Minister Theodor Blank, who is succeeded by Franz-Josef Strauss (CSU), hitherto Minister for Atomic Affairs. The new appointment will probably mean far-reaching changes in the organization of the Defence Ministry and in weapons planning.

The Mind of Mr. Reader

Queen of the Air

Sir,

After looking through the September 1956 issue of *Interavia* I should like to obtain a photograph of one of the air hostesses appearing on page 697, namely, of Miss Anne Price, of B.O.A.C. I am particularly interested as she was a former member of my crew...

Also I would like to take this opportunity of thanking you for the fine presentation and interesting articles in your magazine and hope that this will continue.

CROYDON, Surrey, England. — N. N. Captain, B.O.A.C.

A print has been sent to the Captain. Above, left, is Miss Anne Price, 1954 " Queen of the Air " who recently married a doctor and now is Mrs. John Wilkinson, based at Singapore. To console heartbroken readers, at right is a picture of the girl that may be called Miss Price's successor, Stewardess Mercedes Tait, winner of B.O.A.C.'s " Miss Speedbird 1956 " competition, who is as charming as she looks. We know. We met her at Edinburgh in September. * — Ed. —

Flight without Stress or Strain (contd.)

Sir,

It was not until recently that I had occasion to read the interesting article, *Toward Flight Without Stress or Strain ... or Weight* in the May issue of *Interavia*.

The work presently undertaken throughout the world in an effort to establish the electromagnetic or electro-gravitic principle of controlled flight (usually via a circular airfoil) is impressive. But, as it were, you still conveyed only a minor conception of the actual projects in being.

The Gravity Research Foundation, New Boston, New Hampshire, for example, is a non-profit research and data disseminating organization actually engaged in searching for a means of anti-gravity.

Curious was your claim and apparent support at the end of the Intel account of the conservative—though accurate in reporting—statement that 3 percent of the figure of " flying objects " reported to the U.S. Air Force remain " unidentified ".

To illustrate my point, Captain Edward J. Ruppelt, former head of U.S.A.F. Project Blue Book (the official investigating body for unidentified aerial phenomena), related in his *Report on Unidentified Flying Objects* (Doubleday, 1956) that *in spite of every available means* of correlating reports, using extreme discretion, applying psychological theory, and rechecking with every possible source of origin, 26.94 percent of the Unidentified Flying Objects mentioned in sighting reports remained completely and emphatically unidentified or, more correctly, " unknown ". The balance fell into the categories of " knowns ", " probables " and " possibles ".

Why the measly 3 percent ? Those engaged in research into these phenomena generally believe that the figure is part of an attempt by the U.S. Government (namely, the Air Force) to discredit the subject, for psychological, political or economic reasons.

" Flying Saucers ", many believe, have been sighted by hundreds and possibly thousands over the years. Chapter One of Ezekiel in the Bible renders a rather curious account of our present phenomenon. And both the historians Pliny and Aristotle described aerial " disci " in their writings—" discs " ?

What are Flying Saucers, U.F.O.'s, or whatever you call them ? Maybe no one knows. But one thing is certain—they are not solely indigenous to our present era ; nor are they apparently centered at any one locale or even continent on our dust-speck called " Earth ". To quote the aforementioned Ed Ruppelt—" only time will tell ".

Flying Saucers International, Los ANGELES 35, California — Max B. MILLER, Director.

P.S. : I wish to congratulate you on the excellent periodical *Interavia*.

Sir,

It was to my own loss that I missed your May issue of *Interavia*, but the correspondence in the September issue interested me greatly. I refer of course to the question of Flying Saucers. Mr. S. Pillgram seemed very sure of the fact that the machines emanated from Russia, and I wonder on what authority ?

He seems to presume that man on this Earth is the most, indeed the only, intelligent being in God's creation. Personally, I believe that even the most advanced among us have only a glimmer of knowledge. I am not inferring that weightless flight is beyond our achievement, but it seems to me quite credible that other planets should also be inhabited. What purpose would they serve other than to support life ? Why should they not be more advanced than the majority of men on Earth ? Socially and spiritually we have only made little progress —the main events in our history have been battles...

Madresfield, Malvern, Worcs., England. — G. BELLAMY

Electro-Gravitics will be the subject of a further article in Interavia for December. Meanwhile it was reported from the village of Pajas Blancas in the region of Salta, Argentina, at the end of September, that a " Flying Egg " had landed there. The thing was oval in shape, black with red stripes around it and had a diameter of about 60 feet. It alighted about 350 feet from a group of peasants working in the fields, but when the peasants approached it the object took off, spiralled upwards, converted to horizontal flight and vanished. The mystery is as deep as ever...

— Ed. —

The Old Heat Barrier

Sir,

... On page 368 of your May 1956 issue you publish a notice under " What's in the Air ? " on experiments by Bell Aircraft Corp. concerning the " heat barrier "—a test pilot is said to have withstood for several seconds a temperature a few degrees above the boiling point of water.

It now happens that I have discovered news on a " series of experiments " of a similar nature which might provide the Bell engineers with food for thought. The discovery was made (no one would suspect it) in the " Treasure Trove of the *Rheinische Hausfreund* " by Johann Peter Hebel, dated A.D. 1805. The report follows below, without comment as it speaks for itself :

" ... Four well-known and famous men once upon a time ordered a small room to be heated as much as it was possible. The heat of the air was nearly the same as that of boiling water. But nevertheless the four men withstood it for ten minutes, although not without great discomfort. One of them went even further : in a heat, in which eggs were baked hard in the air within ten minutes, he managed to stay ten minutes ... One can withstand such things if one is prudent and learns from experience."

It seems to me that our ancestors who travelled by stage coach were physiologically better fitted for aeronautics than we, their descendants. Apart from that, Hebel's discovery about " withstanding " is still valid today and could form the foreword of any test pilot's flying licence...

Treis, Mosel, Germany — Werner HELMES

According to the Biblical report on the " Three Men in the Fiery Furnace " (Daniel, Chapter 3) this problem seems to have preoccupied men for a much longer period of time. — Ed —

Remember the earth's rotation . . .

Sir,

In issue No. 7, 1956 devoted to " Safe Journeys, Safe Landings ", one of the articles I read with particular interest was that by Chief Test Pilot Jacques Lecarme..., who speaks of the " timeless controversy between the ground expert, the ' absolutist ', who measures all things in relation to the earth, and the pilot, an enforced ' relativist '... "

All aircraft movement is to be regarded as relative to the earth's surface considered to be at rest. However, not only the air, but also the earth's surface moves... A point on the equator rotates at roughly 25,000 ÷ 24 = 1,040 m.p.h., a point on latitude 50°, such as Frankfurt, at a speed of roughly 625 m.p.h. towards the East. Thus if a rocket were fired from the island of Sao Thomé on the Equator (in the Gulf of Guinea) due North towards Frankfurt (at roughly latitude 50°), it would retain the 1,040 m.p.h. easterly speed and land not at Frankfurt but 1,040 — 665 = 375 miles East of Frankfurt, or roughly near Altvater in the Sudeten Mountains (... provided it flew for *exactly* one hour, which might be possible for the 3,000 nautical miles involved.—Ed.)

The larger the mass of aircraft and the higher their speed in relation to the earth's surface, however, the more important becomes the problem of additional *safeguards* for flying by allowance for the conditions described here. I am enclosing some extracts from my book " Gott gab ein Geheimnis preis " (God has revealed a secret)...

NUREMBERG — WILHELM MICHAEL

Mr. Michael can set his mind at rest. The influence of the earth's rotation is of course allowed for in long-distance navigation based on gyro readings and in independent inertial navigation by unmanned missiles. — Ed. —

* Proof : " Miss Speedbird 1956 " at I.A.T.A.'s' host airlines' dance at Hopetoun House (Scotland).

Book Reviews

Air Navigation. — Published by the U.S. Navy Hydrographic Office (H.O. Publication No. 216) under the authority of the Secretary of the Navy, Washington, D.C., 1955. Obtainable from the Superintendant of Documents, U.S. Government Printing Office, Washington 25, D.C., U.S.A. (English ; 717 pages ; price $7.50).

A complete, well-illustrated, excellently produced handbook on air navigation as practised today : earth and its coordinates, chart projections and interpretation, instruments, elementary plotting, wind effects, dead reckoning, visual flight planning, lines of position, bearings and fixes, relative motion, radio, radar, hyperbolic navigation systems, cruise control, pressure pattern navigation, navigational astronomy, measurement on the celestial sphere, time, the Air Almanac, sight reduction, sextant, special methods, star identification, compass systems, polar navigation, ten appendices (abbreviations and symbols, Loran extracts, H.O. extracts etc.), index.

This book, a direct continuation of earlier publications (" Aircraft Navigation Manual " of 1938 and the wartime " Air Navigation "), is *indispensable* for every professional pilot and navigator. Ri.

La Météorologie du navigant (new edition). — By A. Viaut. — Blondel la Rougery, Paris, 1956 (French ; 288 pages ; 40 cloud plates including 3 in colour ; 150 black and white or coloured illustrations ; 7 four-colour plates ; price 1,950 francs).

Manuel de Météorologie du vol à voile (second edition). — By J. Bessemoulin and A. Viaut. — Blondel la Rougery, Paris, 1956 (French ; 224 pages ; 8 cloud plates ; 170 illustrations by R. Bakalowicz ; price 1,400 francs).

The author of the first book, Director of the French Meteorological Service and President of the World Meteorological Organization, has played a leading role in the marriage of meteorology and flying. His name first came before the public in 1930, after Costes and Bellonte's first crossing of the North Atlantic ; when it came to honouring the authors of this exploit, the meteorologist was placed on the same level as the two flyers, and the public discovered for the first time the role of meteorology in flying.

Since then, this role has constantly expanded. The author's object in writing his " Meteorology for Aircrews " is to make available to all pilots the same kind of instructions and advice which he formerly dispensed for long-range flights.

The book has already appeared in several editions, to keep abreast with expanding knowledge of atmospheric conditions and the changes in the effect of weather on air navigation as aircraft performance increases. A 50 m.p.h. wind does not have the same effect on a Breguet 19 as on a *Caravelle*. Again, jet aircraft operating at high altitudes encounter jet streams, a phenomenon that was of no concern to aviation when air services were operated at 12,000 ft.

The new edition, completely revised to conform to the standards introduced by W.M.O. and I.C.A.O., devotes considerable space to these jet streams, which have only just begun to be exploited rationally. The principles of pressure pattern navigation are also described in detail.

To sum up, this clear, precise, remarkably well illustrated manual will be an indispensable companion for all French-speaking crews.

*

A. Viaut has also cooperated in the preparation of a meteorological handbook for glider pilots, now in its second edition. Designed to reach the mass of amateur flyers, it is written in simple terms, yet contains material of interest to experienced pilots. The text is illustrated by figures, graphs and photographs. Glider pilots who have mastered the principles dealt with in this manual can aspire to high performance, since they will be proof against disappointments.

*

Both books are bound in imitation leather, to prepare them for the constant use they can be expected to get. La.

Elementare Wetterkunde (Luftfahrt-Meteorologie, Band I). — By Dr. H. Regula. Akademische Verlagsgesellschaft m.b.H., Frankfurt on Main, 1956 (German ; VIII+152 pages ; 101 illustrations ; price DM 13.50).

A well-arranged presentation of all known data on the earth's atmosphere and the factors influencing aeronautical meteorology : wind, clouds and precipitation, visibility, icing, thunderstorms. — The book is written particularly for pilots of gliders and powered aircraft, but can also be readily understood by the general public. After all, who is not interested in the weather after such a rainy summer ? — A special section is devoted to the evaluation of weather reports and analysis of weather charts ; photographs illustrate the most important cloud formations ; bibliography and subject index. Ri.

Flieger-Wetterkunde. — By Dr. Hans Sigmund. — Oesterreichischer Luftfahrtverlag, Vienna, 1956 (German ; 71 pages of text, 26-page picture supplement ; 6 tables).

A brief, concentrated introduction to meteorology and weather reporting for aircraft, which will be of valuable service to all sports and professional flyers. He.

Aeroplanes and Aero-Engines (Fourth Edition). — Reprinted from " The Aeroplane ", Temple Press Ltd., London, 1956 (English ; 24 cut-away drawings ; price 5 shillings).

This is the fourth time that the publishers of " The Aeroplane " have reprinted a collection of their very accurate cut-away drawings in a special booklet. The 1956 edition includes some of the major British designs of the past four years, such as the Bristol *Britannia*, Short *Seamew AS.Mk.1*, Napier *Oryx N.OR.1*, Bristol *Olympus B.OL.1* etc. Full recognition for the draughtsmen J. H. Clark, J. Crawley, B. A. J. Hatton, R. J. Way and R. Wood, whose work in the present collection, as in the earlier editions (1942, 1948, 1952), provides a graphic illustration of aeronautical development over the years. Re.

Aircraft Gyroscope Flight Instruments (Sixth Edition). — Published by Sperry Gyroscope Company Limited, Brentford, Middlesex, England, 1956 (English ; 130 pages).

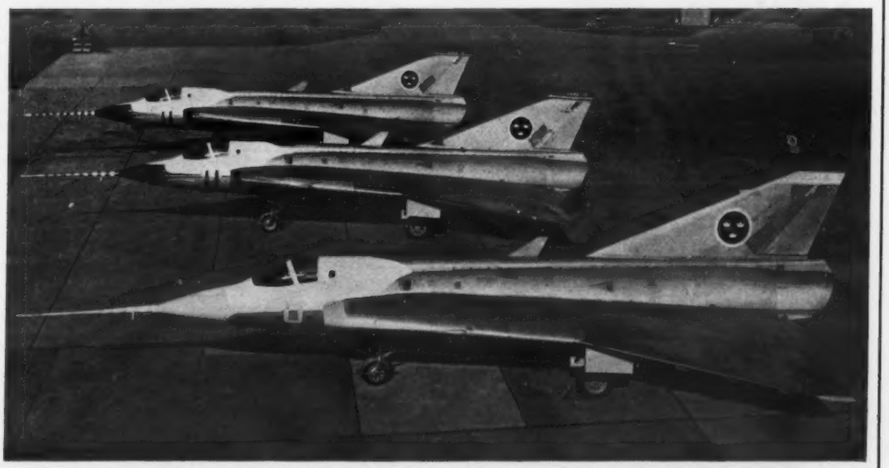
Latest edition of the well-known handbook, 13,500 copies of which have been distributed to the aviation industry throughout the world since 1946 : logically arranged, clearly written, well illustrated. Ri.

Deutsche Funkmesstechnik 1944. — Paper read by Dipl.-Ing. Leo Brandt on February 8th, 1944, on the introduction of centimetre-wave techniques in radar. Special issue by the " Bücherei der Funkortung ". — Verkehrs- und Wirtschaftsverlag GmbH, Dortmund, 1956 (German ; 29 pages and photo supplement).

In his foreword to this brochure the author himself asks : " Is there any point in publishing such a paper today, in 1956 ? " In the world of science, however, the saying " let sleeipng dogs lie " does not apply. Only through constant examination of early developments can dead ends and erroneous decisions be avoided. The book is also a mine of information for the historian of radar engineering, since it provides a concise survey of all the equipment

The Saab-35 Draken in Production

Sweden's Saab-35 (J 35) Draken double-delta supersonic all-weather fighter is now in production, it was revealed at a press demonstration. Fitted with a R.-R. Avon jet engine with afterburner, built under licence by Svenska Flygmotor A.B., the new fighter should reach speeds of around Mach 1.5. One of the three prototypes shown flew past at high supersonic speed at an altitude of roughly 23,000 ft. and gave an impressive demonstration of the single-seat fighter's capacities. — A comparison with the first prototype illustrated in Interavia No. 12, 1955, reveals that certain modifications have been made; for example, three boundary layer fences have been added to the underside of the wings, and a swept, trapezoidal fin placed on top of the fuselage. Otherwise, the aircraft shown do not differ externally from the first prototype exhibited a year ago—a telling testimony to the systematic work of Saab's design office, who followed a completely new path in the wing shape chosen.



JOSÉ PLÁ CARCELES

(Ginés de Bracamonte)

With the death of José Plá, "Interavia" loses a loyal and eminent collaborator. A loyal collaborator in that he was associated with the Spanish edition of the Review from its very first issue; an eminent collaborator in that José Plá, former Professor of Spanish at the University of London and later a senior official of the League of Nations, was well known in Spanish and Latin American letters for his many articles and essays, his monographs for the Spanish Academy of Language and his books, the last of which, "Gibraltar", caused something of a stir in diplomatic and international circles.

But above all, it is as a gentleman of the old school that José Plá will live longest in his colleagues' memory.

available in Germany at the end of the war for aircraft detection, fire control for anti-aircraft guns, navigation, airborne search radar, ships and submarine radar, illustrated by no fewer than 48 figures. Ri.

Les antennes. — By L. Thourel. — Dunod, Paris, 1956 (French; 440 pages; 252 figures; price 4,800 French francs).

This book, based on a course given by the author at France's *Ecole Nationale de l'Aviation Civile*, is written for engineers and technicians wishing to study or refer to antenna engineering. It is thus essentially a working instrument. In his foreword the author points out that the mathematical formulae that accompany any discussion of antenna theory have been reduced to the minimum necessary for an understanding of the text (the practical formulae have, however, been retained).

The subject of antennas for centimetric and decimetric waves is given particular attention, because of their use in radar. The same applies to the aerials used for short-wave directional transmission.

The results of mathematical calculations are supplemented by the results of experiments and by the experience gathered during the development of equipment.

A bibliography is included at the end of each chapter. One fact which emerges clearly is that French works on aerials are rare, so that the present book will fill a sensible need. La.

Stresses in Aircraft and Shell Structures. — By Paul Kuhn. — McGraw-Hill Book Company, Inc., New York, London, Toronto, 1956 (English; 435 pages; price $14 or 105 shillings).

Recent results of structures research by the National Advisory Committee for Aeronautics, collected and edited by the Assistant Chief of N.A.C.A.'s Structures Research Division. A separate chapter is devoted to the theory and calculation of diagonal tension in web systems, a field in which the N.A.C.A. Structures Laboratory has been working for more than 15 years. Wherever possible, problems have been divided into simple tasks—such as can be solved by automatic computers—and more complicated tasks which must be handled by individual methods. The first, analytical part is followed by a second part which deals with experiments designed to check theory and acquaints the stress analyst with recent experimental procedures. Re.

Bemessungstafeln für Staustrahlantriebe (Teil 1 - Unterschall); No. 4 in the series of reports issued by the German Research Institute for the Physics of Jet Propulsion. — By Dr. Irene Sänger-Bredt. — Verlag Flugtechnik, Stuttgart, 1956 (German; printed as manuscript; 495 pages; price DM 80).

In view of the growing use of cheap, simple, weight-saving ramjets (above all in guided missiles and helicopters), these calculation tables, of which the subsonic portion is now available, are of real and immediate value. They will relieve the designer and test engineer of many time-consuming calculations. Numerical tables and graphs show the characteristic sections of these power plants under 120 different operating conditions (at altitudes up to 36,700 ft.), as well as gas condition values, thrust coefficients, efficiencies, fuel consumptions in "ideal behaviour" etc. Finally a bibliography of more than 2,000 titles. Ri.

Taschenbuch für Wehrfragen 1956. — Edited by Hans Edgar Jahn and Kurt Neher, with the cooperation of the Federal Defence Ministry. — Festland Verlag, Bonn, 1956 (German, 470 pages of close print; pocket format; price DM 12).

An indispensable reference book for soldiers, politicians, journalists, in brief for all who wish to know about the German defence organization and its position in the State. Special mention must be made of the fact that a very generous chapter is devoted to the principles of a citizens army. The handbook takes very seriously the principle that the German soldier must be first and foremost a citizen. — A large number of maps, some in colour, tables, statistics, subject index. He.

Die Streitkräfte der NATO-Länder. — By Siegfried Steuer. — J. F. Lehmanns Verlag, Munich, 1956 (German; 116 pages).

A pocket book on N.A.T.O. and the defence organization of the various N.A.T.O. countries (land, air and naval forces) in telegraphic style. Supplemented by data on population size and density, area, currency (with conversions into dollars and marks), civil aviation etc. Copiously illustrated with maps, photographs, section drawings. Very instructive. He.

Studie über die Entwicklung des Flughafens Zürich. — By Prof. Dr.-Ing. K. Leibbrand; published by the Zurich Chamber of Commerce, 1956 (German; 92 pages).

In order to provide a solid basis upon which to plan the expansion of Zurich-Kloten Airport, the Zurich Chamber of Commerce commissioned the author to prepare a report, which has now been issued for public perusal in the form of the present brochure. As countless other airport managements are having to tackle similar problems, this little book will doubtless also be of interest outside Switzerland. He.

Die deutschen Waffen und Geheimwaffen des 2. Weltkrieges und ihre Weiterentwicklungen. — By Rudolf Lusar. — J. F. Lehmanns Verlag, Munich, 1956 (German; 170 pages; price, paper-backed, DM 13).

The author, former commander of the Technical Troops of a German Division, combines his knowledge of German weapons with the conviction that "the war would have had a different outcome and the world a different face . . . if the German weapons that were under development at the end of the war had come out earlier . . ." (page 9). Apart from this . . . strange attitude, the book provides a wealth of detailed information, though not always free from errors and speculations. For example, the (design) level speed of the Bachem *Natter* (p. 105) was nowhere near 1,425 km/h, but around 800 km/h (never reached in practice), and the cutaway drawing of the A9 rocket (p. 101) and the chapter on "Flying Saucers" (p. 81) are pure imagination. Re.

Uns aber gehörte der Himmel. — By Flugkapitän Willy Polte. Recorded and edited by C. G. Schmidt. — Athenäum-Verlag, Bonn, 1956 (German; 315 pages; price DM 14.80).

"But Willy, that's not a career . . . Those are only imaginings. They'll never come to anything." Such was the scarcely encouraging prediction made by Polte senior four decades ago, when Polte junior—the author of this book—left school and said he wanted to become a pilot. And yet it became a career . . . even a life-long career that took Willy Polte through four continents, brought him into contact with the most interesting personalities of contemporary history and provided a wealth of subjects for his camera.

We read these memoirs—much of which at the same time constitutes a story of Deutsche Lufthansa—with close interest and can unreservedly subscribe to the words of Dr. K. Weigelt, Chairman of the Lufthansa board, in his foreword to the book:

"For the future assessment of the romantic period of great pioneer flights in air transport, now largely behind us, there can scarcely be a better description than these unvarnished, frank reports, written with unassuming modesty and powerful humour, by one of the best aircraft captains who flew for the old Lufthansa and its predecessors . . ." He.

Translation

Einsam in Himmelshöhen (title of the American original: "The Lonely Sky"). — By Bill Bridgeman (assisted by Jacqueline Hazard), translated by Dr. Rudolf Frank. — Albert Müller AG., Rüschlikon-Zurich, 1956 (German; 327 pages; price SFr. 18.45/DM 17.80).

This book—the story of Bill Bridgeman and his Douglas D-558-II *Skyrocket* research aircraft—shows how much discipline, care and technical knowledge are required of a test pilot. The reader accompanies Bridgeman into the sombre heights of the stratosphere, learns how—only a few feet away from the flaming rocket motor—he overcomes fear and weakness with iron determination and comes finally to the realization that man here is not the slave, but the brain, of the machine, on which he imposes his will. Re.

Books received

Hiduminium, Technical Data. — Published by High Duty Alloys Ltd., Slough, Bucks. 1956.

Metodo e Organizzazione. — Published by Stato Maggiore Aeronautica Militare, Ufficio Studie, 1956.

25 Jahre Braunschweigisches Institut für Luftfahrtmesstechnik und Flugmeteorologie e.V. — Published and printed by Franz Hess, Brunswick, 1956.

Betriebswirtschaft und Oeffentlicher Verkehr. — Published by Prof. Dr. Leopold L. Illetschko. — Springer-Verlag Vienna, 1956.

Polish Academy of Sciences: Quarterly Review of Publications. — Published by Distribution Centre for Scientific Publications. "Ossolineum" No. 3, Warsaw 1956.

Revue de Mécanique Appliquée. — Published by Académie de la République Populaire Roumaine. Vol. I, 1956, No. 1.

Survival Training Guide. — Published by the Aviation Training Division of the U.S. Navy, November 1955.

The Biological Effects of Atomic Radiation. — Study published by the National Academy of Sciences and the National Research Council, Washington, D.C., 1956.

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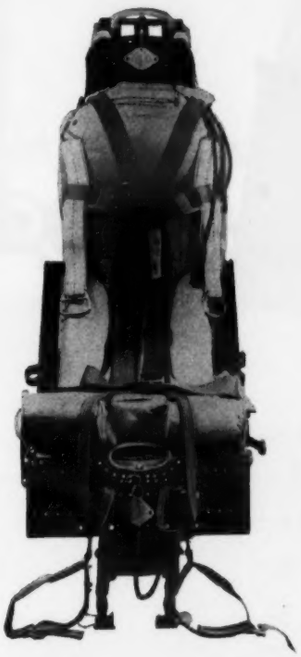

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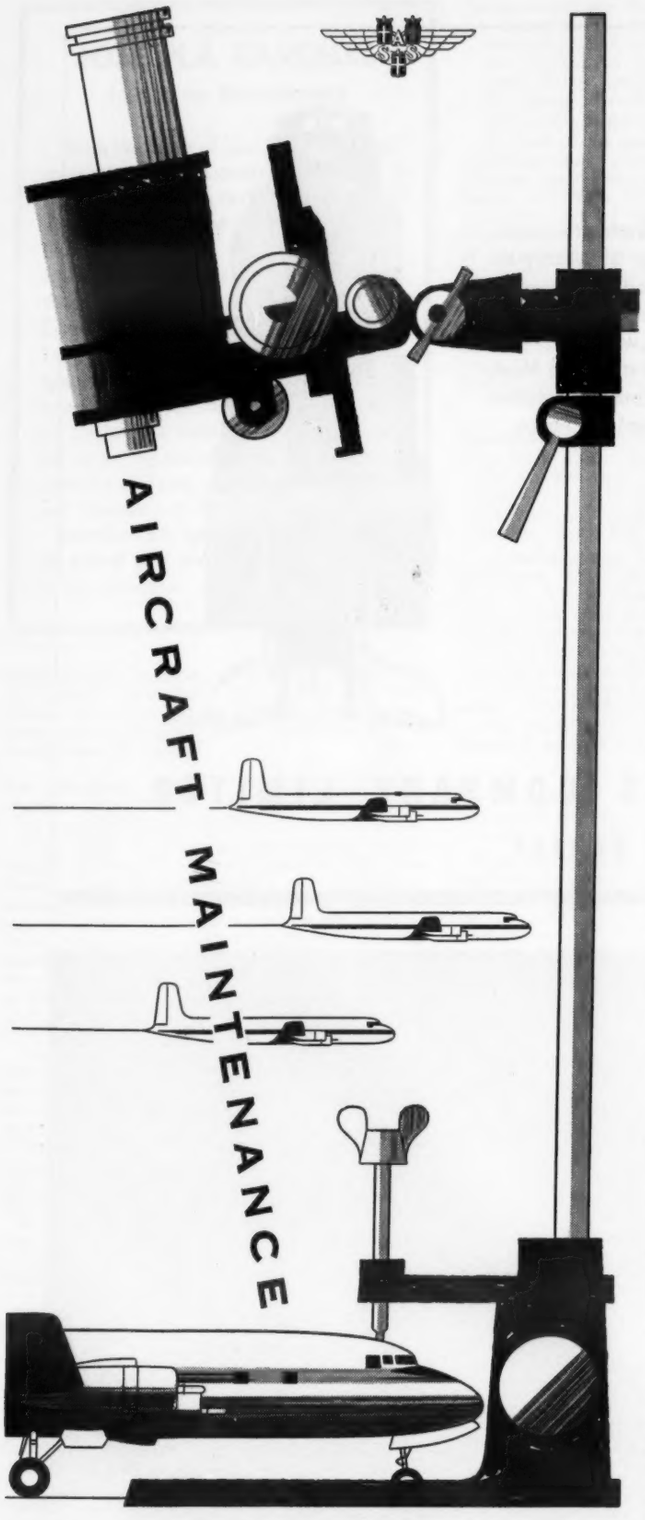

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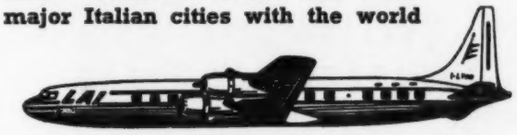

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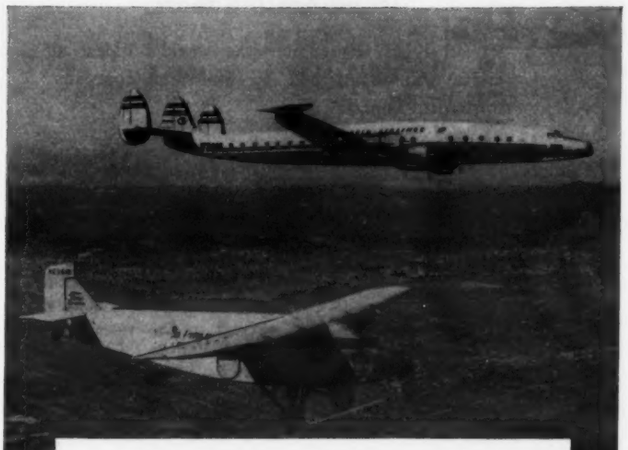

The history of any company is a history of the changing times and fashions, of progress.

So it is with TWA. Pictured above is a Ford Tri-motor aircraft—the last word in air travel back in the '20's and brought out of retirement to fly once again... alongside a TWA Super-G Constellation, the latest addition to TWA's fleet of Constellations, the largest owned by any airline.

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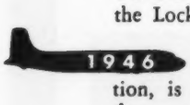
KLM opens the longest air route in the world of that time: Amsterdam-Jakarta.

KLM, as first airline outside the U.S., introduces the all-metal DC-2, wins the London-Melbourne Air Race handicap section.

1936 KLM is the first European company to purchase the world's most widely sold commercial aircraft: the DC-3.

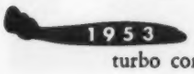
1943 KLM, as first non-U.S. carrier, orders the Lockheed Constellation.



KLM, despite its war-shattered organization, is the first European airline company after the war to open a regular Trans-atlantic service to New York.

1948 KLM is the first European company to put the Convair Liners into service.

1950 KLM is the first European airline to be specially authorized by the U.S. Government to overhaul aircraft of U.S. airlines.



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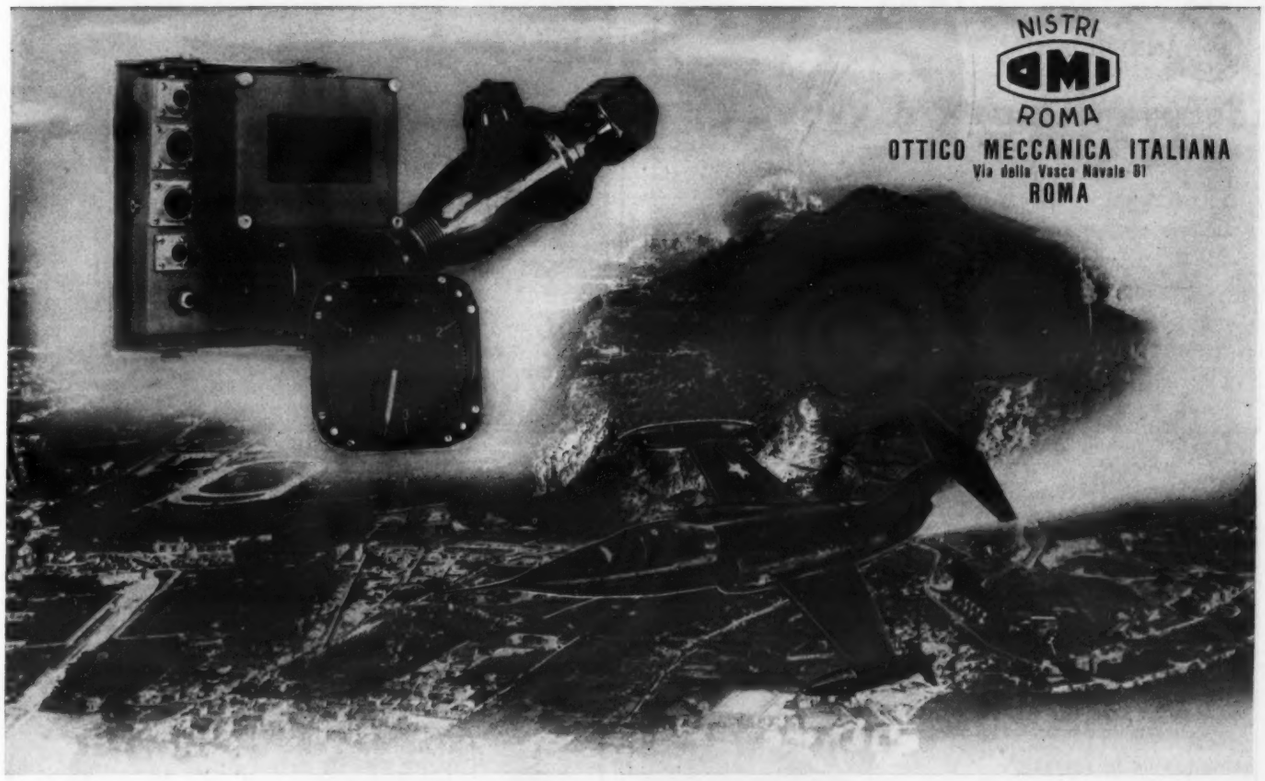

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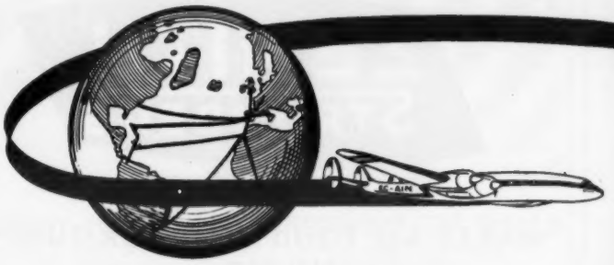

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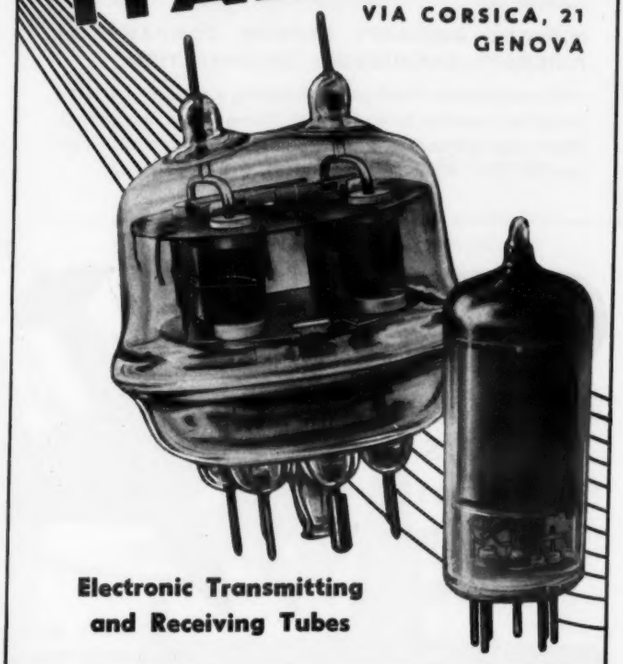

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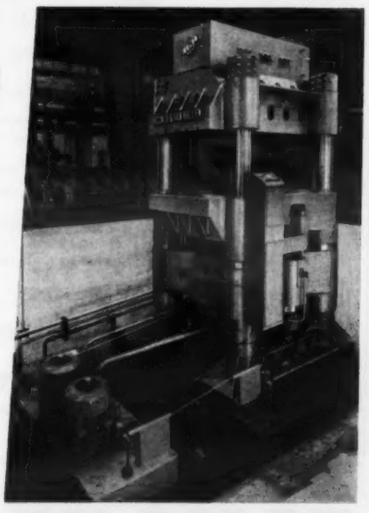

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